Public Private Partnership (PPP): Sustainability in the Context of PPP Educational Building Projects

RENUKA RAJPUT [Thesis]
Technological University Dublin

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Public Private Partnership (PPP):

“Sustainability in the context of PPP Educational building Projects”

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Quantity Surveying and Construction Management
(Rev October 2019)
ABSTRACT

This PhD research focuses on and examines the relationship between PPP procurement and sustainability and further aims to establish whether PPP projects can be sustainable with regards to social, environmental and economic sustainability. The scope of the research is primarily confined to the implementation of construction related sustainability practices within PPPs. It introduces various PPP concepts and critiques the underlying principles for the utilisation of PPP in education sector. This discussion leads to the identification of the core factors common to Sustainability and PPPs and the challenges facing the public and private partners in implementing sustainability in its entirety. In turn, these challenges were analysed and it was found that they manifested themselves through one of the three core factors, namely: risk transfer, value for money & innovation and the disposition of these three factors towards partnership in a PPP environment.

The process was analysed based on the PPP procurement stages. This helped in identifying the current environment in which the PPPs are implemented and the guiding legislations. The main focus of the study was to critically analyse the framework for the delivery of educational construction projects through PPP and to establish whether the PPP procurement route can or cannot support sustainability. To achieve the above, an analysis was carried out of the public and private partners, the key players in the PPP market, to identify how they can influence the inclusion of sustainability.

It then expands on the three pillars of sustainability and its relationship to the key processes of PPP, in the context of PPP educational building projects implemented in Ireland. It concludes with the development of a conceptual model in the form of a step-by-step guide which can be used to achieve greater efficiency in the inclusion of sustainability in a PPP project environment.
DECLARATION

I certify that this thesis which I now submit for examination for the award of PhD, is entirely my own work and has not been taken from the work of others, save and to the extent that such work has been cited and acknowledged within the text of my work.

This thesis was prepared according to the regulations for graduate study by research of the Technological University Dublin (TUD) and has not been submitted in whole or in part for another award in any other third level institution.

The work reported on in this thesis conforms to the principles and requirements of the TUDs guidelines for ethics in research.

Signature Renuka Date: October 2019
Candidate Renuka Rajput
ACKNOWLEDGEMENT

“Not all of us can do great things, but we can do small things with great love”
(Mother Teresa)

I would like to pay my deepest gratitude to my mother and father (RIP), who always motivated me in every aspect of my life. All I have is owed to my parents. My thanks go to all my friends & family members, without whose support and patience this research would not have been possible. So, thank you for putting up with me and understanding during a difficult time. I would like to thank the two most important people in my life, my husband and my son, for their care, patience and affection, and for standing firmly with me and giving me all the support to help me persue my PhD. This project is dedicated to them.

Special thanks go to my supervisor Dr. Louis Gunnigan, who has been a great support and true guide behind my research. He has helped me with constructive criticisms and encouragement, which has helped to put together a wonderful project that will add to the knowledge. Thank you Louis for all your support, without which this research would just not have been possible.

I would also like to thank my Technical Manager, Jonathan Bliss (RIP) & Senior Quantity Surveyor, Mr John Harnett (RIP) without their input this PhD would not have reached its current final stage. A similar appreciation is extended to the interviewees and respondents who took part in the data collection process. This consisted of years of experience and hard work which they were willing to share to provide information about PPPs in education sector - an emerging procurement method for building current and future educational building projects. It is my privilege to share this information with the world. Hopefully, this will lay the foundation for greater things to be done in the field of PPPs.
ABBREVIATIONS

ACS - Athboy Community School

AEC – Architectural Engineering Conference

ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers

BBC – Basic Building Cost

BMS – Building Management System.

BOO – Built Own Operate

BOOT – Built Own Operate Transfer

BOT – Built Own Transfer

BREEAM - Building Research Establishment Environmental Assessment Method

BTO – Built Transfer Operate

CEB - Council of Europe Bank


CIBSE - Chartered Institution of Building Services Engineers

CIE - Commission Internationale de l’Eclairage

CIF - Construction Industry Federation

CSFs – Critical Success Factors

CSR – Corporate Social Responsibility

DB – Design & Built

DBFM – Design Built Finance Maintain

DBFO – Design Built Finance Operate

DBFOM – Design Built Finance Operate Maintain

DBM – Design Built Maintain

DBO – Design Built Operate
DBOF – Design Built Own Finance
DBOM – Design Built Operate Maintain
TUD – Technological University Dublin
DOEHLG - Department of Environment, Heritage and Local Government
DoES – Department of Education & Skills
DoF – Department of Finance
DPER – Department of Public Expenditure and Reform
EC – European Commission
Eco – Economic Sustainability
ECOA – European Court of Auditors
EIB – European Investment Bank
Env – Environmental Sustainability
EoI - Expressions of Interest
EPBD – Energy Performance of Buildings
EPC - Energy Performance Certificate
EPEC - European PPP Expertise Centre's
ESA – European System of Accounts
ESCo – Energy Service Company
EU – European Union
GDP – Gross Domestic Product
GFA – Gross floor area
GGB – General Government Purposes
GP – General Purpose Room
GSCF – Gallen Community School Ferbane
HMT - Her Majesty's Treasury
IASB - The International Accounting Standards Board
IBEC - Irish Business and Employers Confederation
IFRS - International Financial Reporting Standards
IFSL - International Financial Services London
IMF – International Monetary Fund
IPCC – Intergovernmental Panel on Climate Change
IPSASB – International Public sector Accounting Standards Board
IT – Information Technology
ITN – Invitation to Negotiate
ITPD - Invitation to Participate in Dialogue
IUCN – International Union for Conservation of Nature and Natural Resources
KCS – Kildare Community School
KPIs - Key Performance Indicators
KPMG - Klynveld Peat Marwick Goerdeler
LCA – Life Cycle Approach
LCC - Life-Cycle Costing
LCI – Life Cycle Indicators
LEED - Leadership in Energy and Environmental Design
LPG - . Liquefied petroleum gas
M&E – Mechanical & Electrical
MAC - Management Accounting Committee
MEAT - Most Economically Advantageous Tender
MGDD – Manual on Government Deficit & Debt
MPFI – Macquarie Partnership for Ireland
NAO- National Audit Office
NDFA – National Development Financial Agency
NDP – National Development Plan
NEAP - Non-Domestic Energy Assessment Procedure
NTMA - National Treasury Management Agency
NZEB - Nearly Zero Energy Buildings standards
O&M – Operation & Maintenance
OECD - Organisation for Economic Co-operation and Development
OJEC – Official Journal of the European Communities.
OJEU - Official Journal of the European Union
OS – Output Specification
PA - Project Agreement
PBU – Planning & Building Unit
PCD – Portlaoise Campus Development
PDCA – Plan Do Check Act
PESTLE – Political Economic Social Technological Legal Environmental
PFI – Private Finance Initiative
PIM - Project Information Memorandum
PPP – Public Private Partnership
PQQ - Pre-Qualification Questionnaire
PSB – Public Sector Benchmark
PT – Preferred Tenderer
R&D – Research & Development
RCCB – St Rynagh’s Community College Banagher
RICS – Royal Institute of Chartered Surveyors
RT – Risk Transfer
SA – School Authorities  
SB1 – Schools Bundle One  
SB2 – Schools Bundle Two  
SD – Sustainable Development  
So – Social Sustainability  
SoPC 3 – Standardisation of PFI Contracts version 3.  
SPV – Special Purpose Vehicle  
TBL - Triple Bottom Line  
TGD - Technical Guidance Documents  
UK – United Kingdom  
UNCED - UN Conference on Environment and Development  
UNECE – United Nations Economic Commission for Europe  
UNEP – United Nations Environment Programme  
VfM – Value for Money  
VECs – Vocational Education Committees  
WCED - World Commission for Environment and Development  
WWF – World Wildlife Fund

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CHAPTER: 1
INTRODUCTION TO RESEARCH

1.0 Introduction

This PhD research focuses on the relationship between Public Private Partnerships (PPP) procurement and Sustainability. The scope of the research is primarily confined to the implementation of construction related sustainability practices within PPPs. It assesses the current situation regarding the inclusion of sustainability principles and further elaborates on the various criteria required to be incorporated to fulfil and meet the sustainability development targets. It then sets out to develop a conceptual evaluation model, used to increase efficiency and effectiveness of incorporating and assessing sustainability of the PPP building proposals in the educational sector.

To get a global perspective on the PPP models, information was gathered from countries which deliver an extensive PPP programme of educational buildings, e.g. the United Kingdom, USA, Canada, India, Australia, etc. In this study, empirical data was gathered from Europe with case studies carried out in Ireland between 2008 and 2012. Based on the analysis of the data, this study has established a model for incorporating sustainability in the design of PPP educational projects.

1.1 Background of Research

The central focus of this research is on the delivery of educational projects by PPP procurement and the extent to which they implement sustainability on these projects.

Sustainability and its importance to society has increased significantly over the past century (El-Haggar, S.M. & Elkersh, H. 2015, OECD, 2018). In the first half of the 20th Century, businesses and organisations were evaluated on economic-oriented standards (Fussler, M. 2012). However, in the 21st Century, economic variables are evaluated

Sustainable development refers to the process through which the broader concerns of the environment, social factors and ecological issues are considered in a stakeholder and inter-generational context (Bossink, B. 2013; Wilner, T. 2011, ECOA, 2018). This philosophy is internalised by entities and organisations; they are to ensure the responsible use of natural resources and ameliorate the negative impacts of their actions on the broader environment (El-Haggar, S.M. & Elkersh, H. 2015; Gardetti, M.A. & Muthu, S.S. 2014; ECOA, 2018).

Civil infrastructure encompasses the structures and elements of the built environment that allows for human habitation in a modern, societal context (Hardwick, J.M. 2015). It includes various architectural edifices like schools, hospitals, highways, ports, railways, power plants, bridges, tunnels, facilities like water supply and various other facilities serving the societies’ needs. These are fundamental elements of the society that are traditionally the obligation of the government. A public sector has to be in place to design, build and maintain most of these structures to ensure a functional society exists.

However, funding is a major challenge in constructing and maintaining this shared public infrastructure. Due to the lack of good financing vehicles, most governments are not able to sufficiently discharge their obligations by way of providing adequate infrastructure for their societies. The urgent need for such projects and budget shortages experienced by the public agencies has fuelled innovative financing by the means of PPPs (Kumaraswamy M.M. & Zhang, X.G. 2001).

Since the end of World War II, PPPs have gained prominence as a way of discharging part or all of a government’s obligation of delivering adequate civil infrastructure (Kingdon, J.W. 2003; Wilson, C. et al. 2014). This gives the impetus for creating
symbiotic relationships where the public sector uses its power and funds alongside the expertise, finances and other resources from private and in some cases, international partners (Wilson, C. et al. 2014).

The private sector is known for efficient utilisation of resources and this is due to a strong desire for the pursuit of profitability (Burns, P. 2012; World Bank, 2018). Conversely, the public sector is backed by the law of the land to collect taxes and pursue the public interest of the nation (Burns, P. 2012; Yang, H. & Morgan, S. 2011). Therefore, through PPPs, a country’s infrastructural development goals can be met through shared activities and joint ventures. PPPs are viewed as a new and innovative type of governance that facilitates the development of infrastructural projects (Witte, J.M. et al. 2003; World Bank, 2018).

PPPs are often a government service or private business venture that are funded and administered through a partnership of private sector companies with government. Thus, PPPs represent a framework which engages the private sector whilst acknowledging and structuring the role for government, ensuring social obligations and successful sector reforms and public investments are achieved. Responsibilities and risks are optimally distributed among the private and public partners.

In PPPs, the public interest is represented by government agencies like ministries, state-owned enterprises or departments. On the other hand, the private partners might be local or international corporate entities and can include investors or businesses with financial or technical expertise related to the project. PPPs realise the strengths of both private and public sectors in delivering specific tasks and reward for the success of PPPs (Ahmad M. et al. 2014; World Bank, 2018).

The symbiotic and synergistic strengths of PPPs have made them popular around the world for the execution of public construction contracts (Mazzucato, M. 2015;
Nicolaides, P. & Schoenmaekers, S. 2014). Governments of developing, as well as developed countries are increasingly using PPP in procurement processes to bridge the much-needed infrastructure gap (Di Martino, C. 2014).

PPPs are seen as an important tool for producing an accelerated pipeline of infrastructure investments, and meeting the infrastructure deficit. It is rapidly becoming an important part of public procurement for delivering both transport and social infrastructure projects, thus gaining importance as a means to finance much-needed public infrastructure.

The complex nature of developmental challenges, restricted resources, governments’ roles, global acceleration and the rising power of companies in society have added up to the need for PPPs (Estes, R.J. & Zhou, L. 2014; ). This is because government is often poorly equipped to deal with some of these challenges and would need to delegate to third-party private partners (Chatterji, T. & Soni, A. 2016; World Bank, 2018).

The majority of the civil infrastructural development challenges are intricately complex (Estes, R.J. & Zhou, L. 2014). There is therefore an inevitable need for sponsors of public infrastructural projects to define issues in the construction process accurately, interlink these challenges with a host of other issues and ensure each issue is handled adequately within its own context (Selsky, J.W. & Parker, B. 2005; Trist, E. 1983; Waddock, S.A. 1991).

The public sector usually shoulders the responsibility for implementing developmental projects in education, health, and social welfare (Rosenau, M.D. 1999), but presently several governments are struggling with a limited budget, resources and poor management practices (Schwab, K. 2008). On the contrary, private sector entities in the construction industry continue to gain better results and operate according to higher standards of innovation and result-orientation (Rosenau, M.D. 1999).
Public sector organisations are usually stronger in domains that require passion and commitment to individuals (Rosenau, M.D. 1999). These organisations, however, face significant efficiency problems in implementing governmental policies on the ground due to efficiency and effectiveness limits inherent in the public sector (Kolk, A. et al. 2008). Thus, governments partnering with private sector entities seem to be one of the best alternatives to dealing with these shortfalls.

Furthermore, a sustainable answer for developmental challenges also calls for companies’ resources. In this regard, many public sector organisations have shifted from confrontational approaches to partnering with them (Schwab, K. 2008). Partnering in these PPPs for development are seen as a logical and viable response to each sector’s limitations.

PPPs are formed to address a development need that is found in the public domain, which seeks to advance the human wellbeing (UN Charter 1945, Art. 55). Development currently refers to the promotion of higher standards of living and conditions of social and economic progress that markedly affects human life. PPPs can play a key role when the public sector does not have funding to address development problems (Kolk, A. et al. 2008).

According to the database of worldwide Public Works Financing projects, 1,121 PPP infrastructure projects amounting to $450.9 billion investment have been executed between 1985 and 2004 (Sambrani, V. 2014). Most of these projects arise from Europe, Asia, and the Far East (Federal Highway Authority, 2005). Diverse types of PPP models have been used for infrastructure development in developed as well as developing countries.

The Asian Development Bank (2012) & World Bank, 2018 recognises three major factors that motivate governments to enter into PPPs for infrastructure:
• Attracting private capital investment (either to supplement public resources or allocate them for other public projects).
• Increasing efficiency and utilising available resources more effectively.
• Reforming sectors through a reallocation of incentives, roles and accountability.

The majority of governments have limited financial resources, inducing a desire to mobilise private sector capital for investment in infrastructure. Appropriately structured PPPs can mobilise hitherto untapped resources from local, regional, or an international private sector that seek opportunities for investments.

PPP allows the governments to hand over the operational role of a facility to the efficient private sector operators, whilst retaining and improving the focus on delivering core public sector activities/roles/actions like supervision and regulation. Governments put in place innovative methods to deliver construction projects, whereas PPPs allow governments to remove potential challenges and limitations to promote better results in these construction projects.

PPP is a tool that allows the decision makers to reform infrastructure construction processes or service delivery. These help to deliver positive results in projects and in most cases, it could potentially be applied in construction projects with the view of promoting sustainability standards and targets. PPPs are typically designed with careful attention to the context of the environment that enables implementation of partnerships. This way, the project turns out to be more effective and efficient in delivering results.

PPPs have played a central role in answering the pressing need for new infrastructure development, especially in the transportation sector, i.e. roads, tunnels, bridges, airports, ships, railways, and other forms of transportation. Thus, transportation is the largest sector implementing the PPP model in the world.
From Figure 1.1 above, it can be identified that PPP led to the optimisation of resources and the attainment of high results in social and defence sectors, as well as the transport sectors. The results in other sectors were not very significant. However, it gave impetus
to the view that it could be applied in other sectors. This culminated in its application in other sectors like education and housing.

1.2 Purpose of Research

This research aims to provide an efficient way of evaluating and assessing sustainability variables in PPP projects in Ireland’s educational sector. To this end, the research will evaluate and analyse the elements of the Irish educational construction industry with an emphasis on PPP projects and their unique features. This will help to develop a technical evaluation model that can be applied and utilised to increase efficiency and effectiveness in assessing design sustainability for PPP proposals in Ireland’s educational sector.

This research will utilise an empirical process whereby data will be collected. This will help to deduce an appropriate model that can be used to evaluate and analyse educational projects. The emphasis on the proposed model will be on the relationship between PPP procurement and design sustainability.

The recent financial and economic crisis has significantly changed the way Europe considers the role of the private sector in respect of the financing and delivery of public infrastructure and services (Mazzucato, M. 2015). Public investment alone will not be able to provide the necessary investment to boost Europe’s growth in the medium to long term. In this context, different policy options have been explored at European level to attract and facilitate private finance (Burns, P. 2012). The EU has referred to the role of PPP as a vehicle to the much-needed infrastructure deficit (Krumm, T. 2016).

The research carried out by European PPP Expertise Centres (EPEC) reveal that there is neither a common definition of what PPPs are, nor a single model implemented in Europe (Krumm, T. 2016). PPPs can take different forms and have different characteristics.
according to country and sector (Nicolaides, P. & Schoenmaekers, S. 2014). PPP is used as a generic term for the relationship formed between the private sector and public bodies, often with the aim of introducing private sector resources and expertise in fully utilising public sector assets and services, which would otherwise not be possible under the current economic climate (Mazzucato, M. 2015). The United Nation’s definition for PPP that has been adopted in this research states that:

‘Innovative methods used by the public sector to contract with the private sector, who bring their capital and their ability to deliver projects on time and to budget, while the public sector retains the responsibility to provide these services to the public in a way that benefits the public and delivers economic development and an improvement in the quality of life’ (United Nations Economic Commission for Europe, 2008).

PPP projects are based on the assumption that both sectors have particular skills and characteristics providing each with advantages in undertaking certain tasks (Wilson, C. 2014). Quite naturally this has created a widespread interest in the term PPP. This widespread attention in society in general has not been passed unnoticed in the construction industry. Much is being claimed in the press and the public debate as to the inherent benefits of PPP (Birkeland, J. 2012). Attaining the means to accomplish this has resulted in alternative sources of finance being sought, as well as ways of making public sector services more cost effective (Estes, R.J. & Zhou, H. 2014; Nicolaides, P. & Schoenmaekers, S. 2014; ECOA, 2018).

As a result, there are various types of PPPs, established for different reasons, across a wide range of market segments, reflecting the different needs of governments for infrastructure services. (Tang, L. et al. 2010). The possibility of initiating projects that might otherwise not be realised at present is clearly acknowledged and indeed, is an integral part of the debate; several other issues are also brought forward. Examples of
such claims, particularly interesting to those involved in construction, include lower project costs, shorter construction times, and higher overall quality in the end product (McCann, S. et al. 2013; World Bank, 2018).

This enthusiasm with which PPP has been reported amongst some governments is also reflected amongst practitioners (Birkeland, J. 2012). However, despite the apparent acceptance and endorsement of such claims in industry, the theoretical basis to support them seems strangely underdeveloped (Di Martino, C. 2014; World Bank, 2018). Thus far considerable attention has been given to PPP within academic fields, such as accounting, micro and macroeconomics, political and social science (Di Martino, C. 2014; Hurst, C & Reeves, E. 2004). This has generated a noticeable amount of research activity dealing with issues, such as public policy and governance, effects on the public sector financial control framework and expenditure controls. However, comparatively little work has been conducted to understand the sustainable development of PPP; until recently, only sporadic accounts can be found.

Sustainable development as a term was popularised in Our Common Future, a report published by the World Commission on Environment and Development (WCED) in 1987 (Holden, E. et al. 2014). Also known as the Brundtland report, Our Common Future included the “classic” definition of sustainable development: “development which meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission for Environment and Development (WCED), 1987). Acceptance of the report by the United Nations (UN) General Assembly gave the term political salience; and in 1992 leaders set out the principles of sustainable development at the UN Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, also referred to as the Rio Summit and the Earth Summit (World Commission for Environment and Development (WCED), 1987).
Despite a general acceptance that sustainable development calls for a convergence between the three pillars of economic development, social equity and environmental protection; the concept remains elusive (Holden, E. et al. 2014). Since the Brundtland report and the Rio Summit, governments and organisations have taken up sustainable development as a desirable goal and developed metrics for sustainable development, but implementation has proven difficult. Matthews, R. and Hammill, A. (2009) note that the main problem since the Rio Summit has been “in designing the move from theory to practice. Here the tenacious grip of technological, political and other constraints becomes clear.”

It is apparent that the nature of sustainability and its related contexts are new and evolving. Thus, this research aims to create a framework and model through which sustainability could be integrated into PPP construction contracts in Irish school projects. This will help to integrate a new set of variables and indicators that would be utilised in assessing and analysing cases as and when new projects are commenced.

1.3 Contextual Framework

The Ireland’s educational institutions institutionalised free primary education in the year 1831 and this made it imperative for communities in the rural areas to find ways of accommodating the children in their jurisdiction (Biletz, F. 2014). This continued throughout the difficult times of the Irish famine, but ultimately, by the 1850s, every parish in Ireland had a school (Bartoletti, S.C. 2013).

When primary education became compulsory in 1891, the government ensured that every community had a one-room or two-room school building to accommodate the children throughout their studies (Akenson, D. 2012). Through this process, various local schools were merged with newly constructed schools in communities across the country.
However, these public-school systems had major issues and had to be modified and changed significantly.

In recent decades, most parents, schools and religious bodies dissatisfied with the public-school system of Ireland formed a collaboration consisting of parents, religious bodies and other social groups (Green, J. 2011). Most of these schools are currently eligible for state-funding and as such, their infrastructural construction comes under a joint control of the government and private entities (Akenson, D. 2012; Biletz, F. 2014).

“There are 509,652 children enrolled in 3,305 primary schools in Ireland taught by 32,489 teachers” (Department of Public Expenditure and Reform, 2015). In 2012, 62% of Irish children (post-primary) studied in private schools (OECD, 2012). This is in contrast with the period of 1931 when schools in the country were either under the control of the government or religious bodies (Coolahan, J. 1981). This shows the extent to which private involvement and private management have gained root in the Republic of Ireland’s educational sector.

In the late 1980s, Ireland was in need of more schools to service the need of the increasing population of Ireland (Smyth, E. & McCoy, S. 2009). As the demand for schools was increasing and public funds were scarce, it was necessary to explore new ways of procuring school buildings (Akenson, D. 2012). By the late 1990s, it had become clear that a new model was required for funding public projects in Ireland and that the private sector would have to be engaged to build social infrastructure in Ireland (OECD, 2012).

An early form of PPP was first used in the 1990s in Ireland by the transportation sector, the East-Link and West-Link toll bridges, in Dublin (Callanan, M. & Keogan, J.F. 2003). The use of PPP became a central part of government police when it was adopted as a government policy to achieve the targets set by the National Development Plan 2000-2006 (IBEC, 2007). The construction industry had promoted sustainability during the mid
and late 1990s mainly due to the contribution from the EU Structural and Cohesion Funds (Honohan, P. 2009). The rapid growth raised a concern in the business and construction community as it was reaching the threshold (Hurst, C. & Reeves, E. 2004; Honohan, P. 2009). In 1998, the Irish Business and Employers Confederation (IBEC) and the Construction Industry Federation (CIF) presented a strong case for the introduction of PPP as a means of raising the finance necessary for the development of Ireland’s infrastructure (Reeves, E. 2003).

In the period of 2000 and 2007, many public sector buildings in Ireland were constructed through PPPs (Green, J. 2011; Honohan, P. 2009). This was coupled with an unprecedented demographic demand for school places which pressurised the government to find new ways to invest and expand the stock of schools and thus ensure sufficient capacity to cater for demographic demand (Department of Public Expenditure & Reform, 2015).
Figure 1.2: Projections on capacity building for school places (Department of Public Expenditure & Reform, 2018)

Demographics are now the primary determinant of capacity needs and approximately 70,000 pupils will have to be added to the schools (Primary/Post-Primary) by the end of 2017/18 (Department of Public Expenditure and Reform, 2018). The trend is illustrated in Figure 1.2 above with a projection of enrolments up to 2032. The projections show peak of primary school enrolments in 2018 and a further peak in post-primary enrolments in 2025 (Department of Public Expenditure and Reform, 2018).
PPPs will continue to have a role to play in the delivery of key social infrastructure projects, to meet the deficits in particular additional Schools Bundles and projects in the Health Sector (Department of Public Expenditure and Reform, 2018). The private funding market has, however, been particularly challenging for the past number of years. Nonetheless, for those sectors where there are clear and pressing infrastructure requirements and where the PPP model can offer value for money, the Department of Public Expenditure and Reform, in consultation with the National Development Finance Agency (NDFA), will continue to work with Government Departments and agencies and other relevant stakeholders to help access private funding.

NDFA is the statutory financial advisor to State authorities in respect of all public investment projects with a capital value of over €20 million (O'Toole, J. & Dooney, S. 2013). They provide advisory services which spans across different interests and if sustainability is going to be a critical part of such projects, there is the need to integrate it in their evaluations.

The active engagement with the European Investment Bank (EIB) also creates parameters within which public construction projects in Ireland are evaluated. The EIB has been a valuable supporter of PPP roads programme, in particular. The EIB has continued to provide support for the most recent PPPs in the schools and transport sectors. In addition, the EIB and the Council of Europe Bank (CEB) have indicated that they would be willing to provide funding for Exchequer funded projects.
Table 1.1: Financial commitments under PPP - (DBFOM)) Design, Build, Finance, Operate and Maintain Projects (Central PPP Unit, 2018.)

<table>
<thead>
<tr>
<th>Educational PPP Projects</th>
<th>Operational from</th>
<th>Contractual value (€m)</th>
<th>Projected total cost of all PPP payments (€m)</th>
<th>Year of final payment</th>
<th>PPP Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot Schools</td>
<td>2002</td>
<td>63.7</td>
<td>290.4</td>
<td>2027</td>
<td>Schools Public/Private Partnership (Ireland) Ltd</td>
</tr>
<tr>
<td>National Maritime College</td>
<td>2004</td>
<td>51.4</td>
<td>187.8</td>
<td>2029</td>
<td>Focus Education (NMC) Ltd.</td>
</tr>
<tr>
<td>Cork School of Music</td>
<td>2007</td>
<td>49.3</td>
<td>230.2</td>
<td>2032</td>
<td>CSM PPP Services Ltd</td>
</tr>
<tr>
<td>Schools Bundle 1</td>
<td>2010</td>
<td>59.9</td>
<td>245.6</td>
<td>2035</td>
<td>Macquarie MPFI</td>
</tr>
<tr>
<td>Schools Bundle 2</td>
<td>2011</td>
<td>81.7</td>
<td>342.4</td>
<td>2036</td>
<td>Macquarie, Sisks (Pymble Schools Ltd)</td>
</tr>
<tr>
<td>Schools Bundle 3</td>
<td>2013</td>
<td>100.0</td>
<td>410.4</td>
<td>2039</td>
<td>BAM PPP Ltd</td>
</tr>
<tr>
<td>Schools Bundle 4</td>
<td>2016</td>
<td>61.3</td>
<td>215.6</td>
<td>2042</td>
<td>BAM PPP Ltd</td>
</tr>
<tr>
<td>Schools Bundle 5</td>
<td>2017</td>
<td>90.9</td>
<td>255.7</td>
<td>2042</td>
<td>Inspired spaces consortium</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>558.2</strong></td>
<td><strong>2,178.1</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.4 Scope of Research

This research focuses on the interrelationship between the PPPs and sustainability. The scope of the research is primarily confined to the implementation of construction related sustainability within PPP. It aims to examine and clearly identify the extent to which sustainable design principles are being followed in PPP educational projects in Ireland. This research highlights the sustainability practices followed in the project phases leading up to the commissioning of the finished asset, especially the procurement, design, construction and management phases. Given the PPP lifecycle of 25-30 years for each project, an attempt has been made to identify the client’s requirement in determining how sustainable the development will be.

To get a global perspective on the PPP models, information was gathered from countries which are delivering an extensive PPP programme of educational buildings, e.g. United Kingdom, United States, Canada, India, Australia, etc. In this study, empirical data was gathered from Europe with case studies carried out in Ireland between 2008 and 2015. Based on the data analysis, this study has established a model for design evaluation of PPP Educational projects.

As a major construction client, the Irish Government will have to drive sustainability by improving its own performance and translating that into its demands on suppliers and contractors. While the demand for sustainability requirements is growing rapidly and industry is without doubt taking bigger steps towards addressing sustainability in its performance, the Government as a client should clearly drive forward sustainability more widely and more quickly on all projects undertaken and also place sustainability at the heart of construction of most PPP projects undertaken.

As the outputs on PPP projects are defined at the start of the project, it is essential to implement a strict green code for procuring contractors. These elements include health,
social, environmental and other dimensions relevant to a specific construction project (Baietti, A. et al. 2012). As with all developments, the voice of the customer should be taken into consideration to implement sustainable development. In setting sustainability requirements for PPP developments, client specific drivers will have to be considered, not least of which will include delivery within an affordability envelope. This can drive the key criteria required on a project. Techniques, such as life-cycle costing (LCC) are important and whilst LCC is associated with sustainability, it may not provide a comprehensive evaluation. Value for money is about developments that deliver best outturn costs to meet the operational requirements of users to appropriate quality standards (OECD, 2013).

Given that PPP projects run for a typical period of 25-30 years, procurement procedures, targets and reporting are important in demonstrating sustainability. Sustainable development is best thought of as a process for growth that understands, invests in and maintains not just financial resources, but human, social and environmental resources, all at the same time. Only avoidance of the damaging consequences of trading one off against the other can act as a deterrent to achieve sustainability on projects. Sustainability can be as simple as making conscious decisions about how to approach a project. When presented with a wide range of options, the choices made should be to seek balance on economic, environmental and social costs and should benefit at a local and global level.

1.5 Research Objectives

This research aims to develop a conceptual model to be used to increase efficiency and effectiveness of assessing sustainability of the PPP educational projects in Ireland and to provide recommendations to improve the current practice. The specific objectives of the research are:
1. To understand and define the concept of PPP as it applies to the construction industry context.

2. To identify and examine key areas within the sustainability theory that are pertinent to PPP project arrangements.

3. To conduct a critical appraisal of the use of sustainability in the design of PPP provision of educational facilities in Ireland.

4. To review current EU regulation and policies with respect to sustainability in the context of PPP projects.

5. To develop a model that will ensure the inclusion of sustainability as a key factor in design development of a PPP project.

6. To carry out field research to test the model.

7. To refine the model in order to increase the effectiveness of sustainability on PPP educational projects.

1.6 Research Outcomes

Educational institutions in Ireland are significant and important for the development of the early years of Irish citizens. Therefore, it is necessary for this study to achieve and establish the stated objectives of this research in hand:

Objective 1: Literature review was carried out of the subject using the online facilities of the Technological University Dublin (TUD) and the internet. The purpose of the literature review was to summarise the research to date on inclusion of the sustainable development principles followed on PPP educational projects in Ireland and abroad. Details of key points of each article were recorded and filed. Relevant issues were noted and used as a basis for finalising the issues to be investigated later in the research. Further means of assembling the relevant background material included the preparation and
delivery of a paper for a conference in construction procurement. This was planned to establish contact with academics and professionals who are up to date on the emerging issues in this field of knowledge.

**Objective 2:** This narrows the field of study and establishes the specific research questions that were addressed in this work. The PPP pilot projects, and Group of Schools’ projects bundled in one called the Schools Bundle 1 (SB1) and Schools Bundle 2 (SB2) are now operational in relation to educational buildings in Ireland. Also, information was collated from previous research conducted on pilot school projects. As the Minister for Education announced the 23 schools PPP projects, this resulted in creating momentum both at public as well as private sectors.

**Objective 3:** Following the establishment of PPP as a preferred route for the implementation of educational school building projects, this objective addresses the challenges faced by the project participants in incorporating SD into PPP educational school building projects.

**Objective (4/5):** This objective establishes the issues to be resolved in addressing these challenges and this requires the adoption of a wider perspective to include knowledge from the fields of human behaviour and of organisational psychology. It was only after these four objectives were met, an understanding of the stage where the work on objective 5 could be addressed – namely the expression of the current PPP process in the form of a conceptual model – was reached. This model was then used as a basis for further investigation of a means of improving effectiveness of PPP on future projects. At that time in the research process, the initial Irish PPP pilot programme was coming to an end and a number of seminars were being held throughout Ireland to summarise the experience and lessons learned. Attendance at these seminars provided an in-depth understanding of the relevant issues and continue the development of a circle of contacts,
comprising of specific individuals who would later be approached to participate in the research. This concludes the first exploratory part of the research. Part 1 of the research is exploratory, and Part 2 is primary research.

**Objective 6:** This objective overlaps between the exploratory and primary research. At this point, the detailed findings of the research were listed in the form of a conceptual model specific to the area around which detailed fieldwork was carried out. At this stage, the expansive data that was obtained was subjected to in-depth analysis.

**Objective 7:** This objective relates to the testing of the model with planned fieldwork. This further helps to refine the model by testing the findings of the research. This then concludes the research by proposing a conceptual evaluation model for the public authority to implement sustainability, which is effective for educational projects. Please refer to Table 1.2 below.
<table>
<thead>
<tr>
<th>Objective</th>
<th>Research Tools</th>
<th>Outputs expected</th>
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<tbody>
<tr>
<td>1. To understand and define the concept of PPP as it applies to the construction industry context.</td>
<td>Review of government published PPP guidelines, refereed journals, articles, reports and informal interviews with key public and private sector personnel in Ireland and Europe.</td>
<td>Understanding of the principles along with the ethos of PPP arrangements.</td>
</tr>
<tr>
<td>2. To identify and examine key areas within the sustainability theory that are pertinent to PPP project arrangements.</td>
<td>Review of government published PPP guidelines, refereed journals, articles, reports and informal interviews with key public and private sector personnel and fieldwork taking the role of an observer within the specialist PPP unit of Department of Education &amp; Science in Ireland.</td>
<td>Achieving ability to address challenge if greater effectiveness of sustainability is to be achieved on PPP educational School building projects. Refines the research question.</td>
</tr>
<tr>
<td>3. To conduct a critical appraisal of the use of sustainability in the design of PPP provision of educational facilities in Ireland.</td>
<td>Informal interviews with key public and private sector personnel and fieldwork taking the role of an observer within the specialist PPP unit of Department of Education &amp; Science in Ireland.</td>
<td>Summarising of issues in the PPP process preventing greater inclusion of sustainability being delivered.</td>
</tr>
<tr>
<td>4. To review the current EU Regulation and Policies with respect to sustainability in the context of PPP projects.</td>
<td>A thorough literature review on sustainability examining leading academic and technical journals, technical reports, textbooks, case studies and government guidelines and reports. Attendance at seminars to gather the experiences from the PPP programs in Ireland and Europe.</td>
<td>Understanding of the EU regulation and policies on PPP and sustainable development to help understand the issues surrounding and relating to greater inclusion of SD principles of PPP projects.</td>
</tr>
<tr>
<td>5. To develop a model that will ensure the inclusion of sustainability as a key factor in design development of a PPP project.</td>
<td>Attendance at seminars that are being held to gather the experiences on the PPP projects. Enrol as a member of PPP and sustainability forums globally and in Europe to get an overview of best practices followed in this field.</td>
<td>Delivery of a conceptual model to test the relationship between project inputs and project outcomes.</td>
</tr>
<tr>
<td>6. To carry out field research to test the model</td>
<td>Design criteria set on PPP projects that have reached operational stage gathered and analysed.</td>
<td>Refining the developed conceptual model based on the findings.</td>
</tr>
<tr>
<td>7. To refine the model in order to increase the effectiveness of sustainability on PPP educational projects.</td>
<td>Further testing to establish validity, reliability, credibility and transferability of the findings.</td>
<td>Obtaining results that would show the level to which the accuracy of the model can be relied upon.</td>
</tr>
</tbody>
</table>
This thesis is structured into eight chapters as follows:

**Chapter 1 – Introduction**

This chapter comprises of introduction; describing the context and the scope of study as well as presenting the research question and objectives.

**Chapter 2 – Research methodology**

This chapter describes the chosen research strategy. Several research methods are presented and evaluated in the light of how well they fit the research questions and the limitations set for the research. Case study is the preferred research method; explanation for rejection of other methods is presented. The research design is then presented describing how the research was undertaken.

**Chapter 3 – Literature Review on PPP**

This chapter explores the concept of PPP in educational sector in the built environment context. It helps in identifying the rationale behind using PPP model along with its advantages, disadvantages and main barriers. It then looks at the interrelationship between sustainability and the PPP model.

**Chapter 4 – Challengers facing inclusion of sustainability in schools PPP projects**

This chapter further explores the concept of sustainability in the procurement of PPP educational buildings in the built environment context. It scrutinises the legal framework for implementation of sustainable design principles along with the role of contracting authority and the facility providers. It then identifies the various challenges facing contracting authority in implementing sustainable design parameters on PPP educational projects.
Chapter 5 – Case studies

This chapter presents the methodological framework for the multiple case studies that constitute the empirical part of this research. This chapter will give a short description of each of the projects studied, along with the findings of the case study.

Chapter 6 – Analysis of findings

This chapter analyses the findings of the case study projects. It further relates it to the three research propositions.

Chapter 7 – Conceptual design evaluation model

The findings from Chapters 3, 4, 5 and 6 are linked in this chapter through the development of a conceptual model. This then leads to the testing of this model. It examines and documents the output received by testing of this model. It assesses the impact it can bring to these projects, thus validating the reliability of this conceptual model.

Chapter 8 – Conclusion and recommendation

The concluding chapter lists the main findings and recommendations of the research undertaken.

Please refer to Figure 1.3 below
Part 1 is exploratory research and Part 2 is Primary research

**Part 1**

- **Chapter 1** Introduction
- **Chapter 2** Objective 1
- **Chapter 3** Objective 2
- **Chapter 4** Objective 3
- **Chapter 5** Objective 4

**Part 2**

- **Chapter 6** Objective 5 & 6
- **Chapter 7** Objective 7
- **Chapter 8** Conclusion

---

Develop the research methodology

To define the Concept of PPP as it applies to the Construction industry

To identify and examine key areas within sustainability theory which are pertinent to PPP arrangements

Review current EU regulations and policies with respect to sustainability in the context of PPP projects

---

Carry out critical appraisal of the use of sustainability in the design of PPP in Ireland

Analysis of findings

Conclusions and recommendations

Develop conceptual model

Carry out field research to test the model

Refine the model

---

*Figure 1.3: Research design*
1.7 **Practical Application of the Research**

The potential benefits and applicability of this research are summarised with reference to each stakeholder group. The stakeholders considered are:

- Public sector - sponsoring authorities.
- Private sector - service providers.
- School staff and pupils - end users.
- School stakeholders.

**Public sector - Sponsoring authority**

The research will facilitate the identification of early inputs required for achieving greater sustainability of educational buildings. This will in turn enable the efficient and effective use of PPP models in terms of social, environmental and economical sustainability. Use of this conceptual model will guide the sponsoring authority in relation to the requirements to be implemented, to achieve greater sustainability of educational building projects. Despite the staff rotation policy followed in the public service, this model will help eliminate any oversight and give a clear guidance and structure to be followed on aspects of sustainability. This will result in achieving greater sustainability on PPP educational projects thus resulting in more effective use of public funds.

**Private sector - Service providers**

Similar benefits will apply to the private sector partners who will now take on the role of service providers. The application of the model will make each stakeholder aware of the issues that prevent themselves and other partners from performing to the maximum benefit of the entire partnership. Such awareness will bring greater effectiveness in the delivery of services and shorter procurement cycles, thus resulting in reduction of costs.
Application of the model in the private sector will highlight all the skills required to put together a successful team for the entire duration of the project, thereby ensuring that the aims of all partners are accommodated.

*School users - End users*

These include the staff, students of the school and others in the locality that make use of the facility. This research will provide quality educational facility appropriate to its users’ requirements and will have implications for the effectiveness of the provision of such facilities in the future. Architectural studies have shown that sustainable buildings improve the ability of students to learn and also positively impact on the productivity of the staff (Henn, R.L. et al. 2015). This will enable school staff and children to learn about the benefits of sustainable design techniques. It will also have potential implications for the incorporation of innovative features through increased stakeholder involvement at an early stage in the PPP.

The role of these people in identifying issues that may arise is critical to the success of any project. The nature of a PPP requires both the public sector sponsors and the private sector providers, to develop a clear understanding, at a very early stage, of the needs of those employed in the facility to provide the public service. The preparation of the output specification will capture most of the issues involving staff needs, i.e. improved quality of school buildings, working environments of teachers and pupils, teaching environments of teachers and pupils and learning environments of students. It also allows the philosophy and ethos of the school to be strongly bonded to sustainability and if it is integrated into the design of the school structures, sustainability will become a more important and vital part of the mindset of the pupils and stakeholders.
**School Stakeholders**

Possibly the most significant benefit will be the illustration of how sustainable change can be anticipated and managed when the PPP route is chosen to provide a public sector facility. Future stakeholders will have a model that will assist in planning the avoidance of difficulties that arise in the introduction of sustainable development through PPP and thereby maximise the effectiveness of facilities in the context of life-long learning and adaptive re-use; multiple community stakeholder use will better support the long-term sustainability of communities and neighbourhoods. It will also highlight the opportunity to incorporate innovation and creativity into the design of the public sector facility.

1.8 Research Exclusions, Limitations, Constraints, Reservations

1.8.1 Exclusions

This research aims to develop a technical evaluation model to be used to increase efficiency and effectiveness of assessing design sustainability of the PPP school proposals in the educational sector. This research helps in developing a model that will identify and analyse the potential positive or negative outcomes in relation to sustainability inclusion on a PPP school project. The data is gathered from PPP school projects implemented in Ireland. It is not intended to provide in-depth investigation into other PPP infrastructure projects such as transportation, health, housing etc. However, the principles of this model can be used on other sectors and such applications would be subject to future research. The main application of this model is to demonstrate greater inclusion of sustainable design principles in implementing PPP school project.

1.8.2 Limitations

One of the primary limitations on this research is that the projects studied, SB1 and SB2, were the only projects of their type in Ireland that were in the pre-procurement stage at
the time this research commenced. The only school projects implemented prior to SB1 and SB2 were the pilot school projects. After the implementation of the pilot school project the Irish PPP process went through a review. Also, these projects had reached the operational stages and thus would limit the involvement with the pre-procurement and procurement stages of the project. Moreover, very limited documentation was available on these projects. In case of SB1 and SB2 case study bundles, projects were chosen based on the documents available and any shortfalls in the documentation to be covered by the availability of interviewers and interviews conducted.

1.8.3 Constraints

PPP and sustainability are two very distinctive and extensive topics. Information is available on individual topics, but very little information is available inter-relating the two topics. So far considerable attention has been given to PPP within academic fields such as accounting, micro and macroeconomics, political and social science. However, comparatively little work has been conducted within the field of sustainable development in PPP; until fairly recently, only sporadic accounts can be found. Because the two topics are very distinct, the extent of the research to be carried out was constrained by the time allowed.

1.8.4 Reservations

The main reservation to this research was the amount carried out in the Irish industry in relation to these topics. There was very little independent research done on this topic, also limited literature was available in the form of referred papers, commissioned reports and documents produced by private and public sector. Thus, the research was extended to literature review that exists on PPP/PFI in the UK and in other countries.
CHAPTER: 2
RESEARCH METHODOLOGY

2.0 Introduction

This chapter will provide an overview of research methods and will evaluate the extent to which each method is appropriate to the specific research questions and/or aims and objectives of research, i.e. the type of knowledge to be discovered – descriptive, explanatory or exploratory (Yin, R. Wing, C.K. et al. 1998). Thus, this chapter is structured to provide a clear understanding of steps taken in carrying out this research. It covers the following:

- Research paradigm
- Research frameworks
- Research process
- Research design
- Research strategy
- Research method
- Research analysis
- Data testing

2.1 Research Paradigm

phenomena, and the designs and methods that are most appropriate to answer research questions.

According to G. LoBiondo-Wood and J. Haber (2014), research is a systematic and logical enquiry that aims to answer questions or solve problems. In other words, generating knowledge through the research process will provide new insights that can both improve methods and test their effectiveness (Gerrish, K & Lacey, A. 2010). The Philosophy adopted in research influences the thought process by developing knowledge, the thought process undertaken by the researcher is governed by ontology, epistemology and axiology factors (Jankowicz, A.D. 2015). These three factors contribute greatly to the philosophy being pursued.

There are several perspectives to philosophy as the body of knowledge is continuously expanding; among them are positivism, interpretivism and realism. Each of them has distinctive characteristics in developing knowledge based on associated research methods.

Positivism is derived from the positive sciences and holds the belief that natural science methods can be used to study human behaviour. The underlying scientific approach of the positivist is that an orderly reality can be studied in a systematic fashion from the definition of a problem through to its solution (Polit, D. & Beck, C.T. 2013). It can be inferred that a positivism approach is closely associated with quantitative methods due to the high dependency on empirical findings.

In contrast to positivism; the interpretivism or constructivism perspective emphasises a great deal on the social impact brought about by the human factor, that influences the decisions made pertaining to the area of study (Easterby-Smith, M. et al. 2004; Saunders, M. et al. 2009). P. Ghauri et al. (1995) claims that the interpretivism approach values individual experiences and the compulsion for empirical data to support findings is not
necessarily a requirement. The wider acceptance of qualitative findings based on human behaviour shows a clear link between interpretivism and qualitative methods (Lincoln, Y.S. & Guba, E.G. 1999).

Realism or post positivism acknowledges the ‘reality’ and the independent existence of nature and the environment (Burningham, K & Cooper, G. 1999) and is rather non-holistic, whereby the outcome of events is independent of the human factor and that the presences of larger social forces, structures and processes shape the results (Saunders, M. et al. 2009).

Hence the three research philosophies are unique in their approach and depend on the appropriateness to the research question. Thus, it is important that the research philosophy and the area of study coincide with one another.

PPP projects are implemented in real life settings and are integrated with people and processes. A PPP project is based on a decision-making process and is affected by the people involved and the environment in which these decisions are made. It is essential to capture, observe and analyse the decision-making process to see the extent of influence that the surrounding environment has on the project. Thus, the actions generated from human behaviour during decision making can generate rich qualitative data which could provide information and reasoning to the research question - refer fig 2.1.

![Fig.2.1: Research approach (Adapted from Saunders, M. 2009)](image_url)

From a philosophical point of view, therefore, a constructivist-interpretivism stance is being adopted. As mentioned previously, the philosophical approach is supported by an
appropriate research method that delivers with the research objectives. The next section focuses on the research approach adopted for this study.

2.2 Research Framework

A framework is a structured approach, it provides a guideline or reference to ensure that objectives of the research are achieved. This allows for planning the research journey and in addressing the research problem. The framework developed depends on the level of detail required for the research.

The following section provides a description of the framework that has been identified to link individual propositions, while allowing flexibility to each proposition to function independently in the research. The frameworks are formulated to extract the importance of sustainability in a PPP project environment. The frameworks are structured to identify the mechanism adopted in identifying the problem, the research type, the data collection techniques and analysis deployed. The related frameworks are:

- Conceptual framework
- Research methodology framework

2.2.1 Conceptual Framework

A conceptual framework is a graphical or narrative form of representation of the key attributes of a research study (Miles, M.B. & Huberman, A.M. 1994). These key attributes represent a number of parameters that are of concern in this study. As the research progresses, it will also reveal the interrelationship between these parameters. Based on this approach a conceptual framework is adopted, see Figure 2.2.
2.2.2 Research Methodology Framework

This section describes the PPP research framework and is structured to derive the “key issues in implementation of sustainability on PPP projects”. The key PPP & sustainability concepts and implementation issues along with key drivers and enablers, will be an integral part of this framework. In constructing this framework, a phenomenological approach will be followed. The research flow will follow the structure as shown in Figure 2.3.
Based on the framework as presented in Figure 2.3, PPP & sustainability concepts, barriers, drivers, enablers and issues will be derived from a critical analysis of literature review. These have been presented in Chapter 4.

### 2.3 Research Process

A doctorate thesis aims to contribute to the advancement of science and knowledge and, as (Phillips, E.M. 2000 & Pugh, D.S. 2000) stated, it aims ‘to get the answers to why questions, to find explanations, generalisations and theories that can provide answers that develop the understanding, always involving decision making and policy formulation’.

As described in the subsequent Research Design Sections in any research three types of questions are always asked (Sekaran, U. 2016):

a) **The research considerations**: (i) The What question. What is the research object (concept analysis, definition)? This is the ontological question. (ii) The Why question. Why the research is needed? (The purpose of the research). This is the relevance question. (iii) The How question. How can the research be answered? (The procedures to be adopted and design of the research). This is the epistemological question.
b) **The research communications:** (i) The What question. What concepts can be used in defining the research object? (Conceptual – ontological-metaphors). These questions are for the information gathering. (ii) The Why question. Why has the research been done? (Research interest - rhetoric). This is the understanding of the communication process. (iii) The How question. How to convince the reader of the scientific nature of the research text? (Scientific rhetoric). This is the utterance communication process.

c) **The research process:**

The above-mentioned research considerations, research communications and research process will be adopted during the various stages of this research thesis process to define:

- **What will be done:** The research questions, as stated in section 2.4.1, will be the basic direction of this study.

- **Why it will be done:** In order to develop the theoretical frameworks, to define the conceptual frameworks (models), this will provide the justifications for the research questions.

- **How it will be done:** This is the description of the procedures to be adopted in order to answer the What questions (intelligence gathering – descriptive work) and Why questions (which look for explanations, relationships, comparisons and predictions).

The process as shown in Fig 2.4 – deciding what to do, collecting information, critically reviewing, discarding irrelevant information, analysing the relevant information and arriving at a reflective conclusion in a systematic procedure – enhances the personal development of the researcher as well as adding to the cumulative knowledge of the subject (Revans, R.W. 1971; Gill, J. & Johnson, P. 2010).

Research is done to achieve specific goals, relies on specific methods and is done systematically (Ghauri, P. et al. 1995). The researcher explains how the information is collected, argues for the results obtained and explains their limitations.
The research process has been defined by the research questions as stated in section 2.4.1 and these are formulated through a phenomenological study. The research steps are important as they provide fundamental support that is required in identifying and addressing the research problem. The study has been undertaken as a series of steps, as identified in Figure 2.4.

The first step in research process is literature review, which helps in clearly identifying what is needed to be researched. It aims to help identify the problem, provide in-depth understanding of the area to be researched and how this piece of research can contribute to the existing body of knowledge. The PPP concept was not new to the author, as the author has extensive experience in PPP procurement which provided a strong baseline working knowledge of the subject. However, it did not simplify the literature review exercise as the focus was on interrelationship between PPP and sustainability.

The second step in the research is information gathered by fieldwork and how this information is evaluated and reviewed as sample data. This data will be gathered on PPP project delivery. This will be done by interviewing and gathering data from various sources available. The procedure will lead to the gathering of information in ways that will help to get an overview of theses researched projects. This will then lead to specific evaluation for value for money, risk transfer and innovation which will be identified from the literature review as the main basis for implementing PPP projects. The procedure will help to provide an overview of what actually exists and how it meets or fails to meet the core essence of undertaking PPP projects.
Fig. 2.4: Key Stages in a Research Process (adapted from Clark-Carter, D. 2004)

Ultimately, the any gaps identified in the critical analysis will be used as a basis for the formulation of the proposed model. This procedure will include answering basic questions about the research and how it meets the core principles of a sustainable project in general.
2.4 Research Design

The research design is a part of the research process and is based on the research objectives and questions. The research design is developed to answer in detail the What, Why and How questions at four levels. These levels are steps that will lead to the development of proposed conceptual model, which are outlined in figure 2.5 below:

**Fig. 2.5: Research Process for PPP School Project**
LEVEL 1:

- What? - Identify and define the concept of PPP and sustainability as it relates to PPP schools project.
- Why? - To investigate the areas needed to achieve greater inclusion of sustainable development on PPP school projects.

LEVEL 2:

- What? - Outline the key areas within sustainability that are pertinent to the PPP project arrangement.
- Why? - Provide a guideline to how the two topics relate to one another and how to move from ‘actual’ practice to ‘conceptual’ structure.
- How? - Link the PPP & sustainability concept identified in Level 1 (L1) and relate it to the technical assessment criteria of the PPP school project.

LEVEL 3:

- What? - PPP project investigation through empirical case study (qualitative & quantitative) and semi structured interviews with key PPP professionals.
- Why? - To list and identify the criteria relating to the three-pillar sustainability model - social, environmental and economic.
- How? - Combining the outcome results from empirical case studies, semi-structured interviews of completed PPP projects to help develop the conceptual model.

LEVEL 4:

- What? - Combine the outcome results from Level 1 (L1), Level 2 (L2) and Level 3 (L3) to propose a “Conceptual Model”.

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• Why? - By providing guidelines to determine what is to be improved in PPP school project to achieve greater social, environmental and economic sustainability.

• How? - To combine and contrast the “actual” practices with the “conceptual” model.

As mentioned by R. Yin (2013) there are five main components in a research design using case studies. They are as follows:

• The research questions
• The propositions being tested
• Unit of analysis
• Linking data to propositions
• Criteria for interpreting the research findings

2.4.1 Research Question

Based on the research method as defined in Section 2.6, it sets out to explore and answer the principal research question:

1. Does the PPP procurement route support the implementation of sustainable development principles in construction of school projects in Ireland?

This research shall assess the current situation regarding the inclusion of sustainability principles in PPP projects. What is the relevant guiding legislation? What is the current practice? And what is the position of the key players in the process? The research will examine whether the PPP procurement route supports sustainability.

To answer these generic research questions the following section presents the detailed research aim and objectives for this thesis.
2.4.2 Research Aim and Objectives

This research aims to develop a conceptual evaluation model to be used to increase efficiency and effectiveness of assessing building sustainability of the PPP proposals in the educational sector. In gathering data, the research will concentrate on PPP projects concerned with the provision of schools’ facilities. This is adopted in order to offer improvements to current practice. The specific objectives of the research are:

1. To define the concept of a PPP as it applies to the construction industry context
2. To identify & examine key areas within sustainability theory which are pertinent to PPP project arrangements
3. To carry out a critical appraisal of the use of sustainability in the design of PPP provision of educational facilities in Ireland
4. To review current EU Regulation and Policies with respect to sustainability in the context of PPP projects
5. To develop a model that will ensure the inclusion of sustainability as a key factor in the design development of a PPP project
6. To carry out field research to test the model
7. To refine the model to increase the effectiveness of sustainability on PPP educational projects

2.4.3 Propositions to be tested

Below are the following propositions that will be investigated:

- Sustainability inclusion on a PPP project is dependent on relationship between VfM, RT and Innovation
- Inclusion of sustainability is associated with degree of flexibility within PPP procurement
• In a PPP project, trade-offs occur between Social, Environmental and Economic sustainability

2.4.4 Unit of Analysis

The unit of analysis provides focus within a case study. Understanding unit of analysis can give a clear direction to the tools and techniques to be used in collecting the relevant data associated with unit of analysis. In a PPP case study project, sustainability should be embedded within the case study and should consists of social, environmental and economic sustainability sub-units. The Sub-sub-units of focus are value for money, risk transfer, and innovation. Hence each unit of analysis will consist of three sub-units. A summary of unit of analysis and sub-units are stated in Figure 2.6.

![Diagram of Unit of Analysis](image)

**Figure 2.6 Unit of analysis (Adapted from Gunnigan, L. 2007)**
2.4.5 Linking data to propositions

In order to establish sustainability inclusion on PPP projects two types of data are required.

- Data from the PPP projects identifying clearly the success or failure of the project in relation to sustainability inclusion. This is divided into two stages, the pre-procurement and the post-procurement stages. This will address the first and second proposition and will be a desktop exercise which will use data from the documents and case studies. The data gathered will be cross-checked with the data gathered from the interviews.

- The third proposition will be gathered from the interviews conducted and will focus on the social, environmental and economic sustainability and how they relate to one another.

2.4.6 Criteria for interpreting research findings

An important factor in this research is to have a consistency of information produced between the two case study projects. It is equally important to have essential criteria for judgement of project outcomes consistent across the two case study projects.

The design of the case study method using the multiple case study approach has been elaborated in detail in section 2.4.8.1. The multiple case study will enable this study to examine elements of PPP in school building projects from several angles and this will help to create an inductive framework that will give insights into the various aspects of the realities on the ground. This allows for standardisation and reliability in data obtained.

The findings of research are based on sustainability inclusion on PPP projects. The definition used for sustainability is based on report produced by UN (1997). The parties involved in SB1 and SB2 PPP projects were interviewed and triangulated with supporting documentation. Interpretation of qualitative data needs to be consistent and reliable.
2.4.7 Validity and Reliability

The validity and reliability of a research project is based on the trustworthiness of how the research has been carried out. Also, the work done could be cited in other research works as reference. Reliability as defined by Zikmund, W. (1997) as the degree to which measures are free from error and thus ensure consistent results. Validity is defined as the ability of the measuring instrument to measure what was intended (Zikmund, W. 1997). Saunders, M. (2009) equates reliability to consistency. He also states that primary constraint to reliability is participant error and bias, and observer error and bias. As per Saunders, M. (2009), the level of assurance regarding the true finding is true representation of the events. As per Bryman, A. (2015) validity is associated to integrity of the research findings and reliability is an indicator of how repeatable the study is. According to Yin, R. (2013) there are four tests in a case study to determine and ensure validity and reliability have been incorporated in the research design, as illustrated in Table 2.1 below:

Table 2.1: Case study tactics for four quality design tests (Adapted from Yin, R. 2013)

<table>
<thead>
<tr>
<th>TESTS</th>
<th>CASE-STUDY TACTIC</th>
<th>PHASE OF RESEARCH IN WHICH TACTIC OCCURS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct validity</td>
<td>Use of multiple sources of evidence; Establish chain of evidence; Have key informants review draft case study report</td>
<td>Data Collection</td>
</tr>
<tr>
<td>Internal validity</td>
<td>Do Pattern matching; Do explanation building</td>
<td>Data analysis</td>
</tr>
<tr>
<td>External validity</td>
<td>Use replication logic in multiple case studies</td>
<td>Research design</td>
</tr>
<tr>
<td>Reliability</td>
<td>Use case study protocol; Develop case study database</td>
<td>Data Collection</td>
</tr>
</tbody>
</table>
2.4.7.1 Construct Validity

Construct validity refers to "...the degree to which a test measures what it claims, or purports, to be measuring." (Scruggs, T. & Mastropieri, M. 2014). Construct validity involves the acceptance of a set of operations as an adequate definition of what needs to be measured. This ensures that the inferences and scores of a given research are appropriate and fit the end it seeks to provide.

Evidence from various sources was pursued and collected to attain construct validity within the research design. The literature review of existing journals, reports and documents in the public domain was used to establish a background to PPP. Subsequently interviews with PPP professionals from the private and public were carried out. A similar strategy was used in the specific case studies. Specific documents and reports directly associated with the respective cases were reviewed and the findings cross-referenced with interviews.

Cross-referencing has been the focal point to ensure that the evidence collected within the cases demonstrates a continuous chain of evidence. Based on the outcome of literature review, the research questions were developed to determine gaps in the body of knowledge. Subsequently research questions were used as the basis to draft the case study protocol. Within the protocol, three propositions were formulated to be tested which revert back to the research questions. The propositions used in the case studies helped in developing the case study database. The case study database was then used to prepare the case study report. The report comprises of individual cases and cross-case analysis.

To further add to the validity of the report produced, interview data transcribed was reviewed by the respective respondents to verify its contents. Subsequently their comments on the final report were documented and reviewed to ensure that the interpretation of the data and conclusions made had avoided the elements of observer
error and bias. The amendments requested were cross-checked with interview recordings and documents to discard any participant’s error and bias before making changes to the report.

2.4.7.2 Internal Validity

As per Yin, R. (2013), the internal validity can be achieved by use of case analysis, cross-case analysis, pattern matching and expert peer review to demonstrate the internal consistency of the information collected. Saunders, M. (2009) adds that internal validity is reflected by the right measurements obtained. Similarly, a causal relationship is another measure according to Bryman, A. (2015). According to Rowley, J. (2002) and Yin, R. (2013) in a case study method, internal validity is of primary concern of explanatory studies and is invalid to descriptive and exploratory studies. The measures undertaken to embed internal validity within the instrumentation of this study is described further in Section 2.7.

2.4.7.3 External Validity

External validity/transferability is defined as the scope to which the research findings can be replicated beyond the proximate research case studies (Lincoln, Y.S. & Guba, E.G. 1999; Miles, M.B. & Huberman, A.M. 1994; Yin, R. 2013). Case study research carries out analytical generalisations in which particular findings are generalised into a broader theory and this can be achieved through the use of multiple case study methodology and by comparison of evidence (Lincoln, Y.S. & Guba, E.G. 1999; Miles, M.B. & Huberman, A.M. 1994). The case studies in this research are exploratory. The purpose is to explore and test the theory presented in Section 2.7. The process is further extended by carrying out a multiple case study approach, which will be discussed in detail in Section 2.7, to achieve replication. Hence the replication logic characteristic allows analytic generalisations of the research findings.
2.4.7.4 Reliability

As indicated earlier, the reliability theory is essential for replication of the study. Hence in this study a case study protocol has been developed to ensure uniformity and standardisation between case studies. The case study protocol is attached as Appendix 3. Consequently, data collected from the various sources are compiled and stored in a database.

2.4.7.5 Triangulation

Triangulation is the combination of methodologies in a study of the same phenomena (Patton, M.Q. 1990). Using multiple sources of data to analyse the problem is a major strength of the case study approach (Yin, R. 2013). This enhances the reliability and accuracy of the findings.

There are four basic types of triangulation:

- **Data triangulation** – The use of a variety of data sources (interviews, archival material, observational data)
- **Researcher triangulation** – The use of several different researchers to achieve agreement
- **Theory triangulation** – The use of multiple theory perspectives to interpret a single set of data
- **Methodological triangulation** – The use of multiple methods to study a single problem, for example, combining quantitative and qualitative methods in a single study (Padgett, D. 1998)

Patton, M.Q. (2002) identified time and cost as two factors that would have an effect on the type of triangulation selected. Based on the limitations it is the choice of the researcher to select the triangulation best suited to the study. Robson, C. (2002) is of the opinion that triangulation has the potential to contradict between sources. This possibility is echoed
by Miles, M.B. and Huberman, A.M. 1994 in which the element of inconsistency has been highlighted.

The importance of triangulation has been acknowledged by numerous sources and is well documented. It is an essential component of research and particularly in qualitative research to establish greater validity and reliability. In this study, data triangulation has been observed throughout the research design. During the initial stage of the research, both documentation and interviews were used to establish the basis for the study as well as to determine a baseline as to how sustainability is viewed within the context of the PPP. Subsequently during the case studies, documentation, interviews and direct observation were used to collect data. The strengths and weaknesses of the three data sources used in this study are tabulated in Table 2.2:

**Table 2.2 Strength and Weaknesses of Data Sources (Adapted from Yin, R. 2013)**

<table>
<thead>
<tr>
<th>Source of Evidence</th>
<th>Strength</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation</td>
<td>Stable- can be reviewed repeatedly</td>
<td>Retrievability- can be difficult to find</td>
</tr>
<tr>
<td></td>
<td>Unobtrusive- not created as a result of the case study</td>
<td>Biased selectivity, if collection is incomplete</td>
</tr>
<tr>
<td></td>
<td>Exact- contains exact names, references and details of event</td>
<td>Reporting bias - reflects (unknown) bias of author</td>
</tr>
<tr>
<td></td>
<td>Broad coverage- long span of time, many events and many settings</td>
<td>Access - may be deliberately withheld</td>
</tr>
<tr>
<td>Interviews</td>
<td>Targeted- focuses directly on case study topics</td>
<td>Bias due to poorly articulated questions</td>
</tr>
<tr>
<td></td>
<td>Insightful - provides perceived causal inferences and explanations</td>
<td>Response bias</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inaccuracies due to poor recall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflexivity - interviewee gives what interviewer wants to hear</td>
</tr>
<tr>
<td>Direct observations</td>
<td>Reality- covers events in real time</td>
<td>Time consuming</td>
</tr>
<tr>
<td></td>
<td>Contextual - covers context of &quot;case&quot;</td>
<td>Selectivity - broad coverage difficult without a team of observers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflexivity - event may proceed differently because it is being observed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost - hours needed by human observers</td>
</tr>
</tbody>
</table>
2.4.8 Case study design

The case study used in this research is based on the projects available during the time of this study in relation to school building procured by PPP route in Ireland. The projects used in this research were based on availability and thus cannot be differentiated as good or bad projects. According to Yin, R. (2013), a good project is an exemplary case study. However, an exemplary case study alone will not guarantee good results but rather a combination of factors and mastering the skills will produce a good piece of research using case study method.

2.4.8.1 Case Study Selection Criteria

The case study selection has been implemented using both the theoretical and pragmatic criteria.

2. 4.8.1.1 Theoretical Criteria

- The case studies will focus on PPP school projects
- The PPP school projects of focus will be projects implemented in the Republic of Ireland
- The PPP school projects implemented by public sector in Republic of Ireland
- The PPP school projects implemented in Ireland by the public sector should be in their pre-procurement and procurement stages

2. 4.8.1.2 Pragmatic Criteria

- Based on availability and potential PPP school projects as case studies
- Time limitations to complete the data collection phase
- Cost limitations during the data collection phase
- Willingness of the public sector to cooperate in this research
2. 4.8.2 Design of case study

A multiple case study design is used in this study. The selection has been based on a review of existing case study designs and its suitability in meeting the needs of the research questions and objectives. The suitability of the multiple case studies is also reflected in the project selection criteria. PPP projects as implemented by public authority i.e. Department of Education & Skills. The multiple case studies are designed to identify the discrepancies in implementing PPP projects by public authority.

The other characteristic of the multiple case studies is that they are embedded case studies. As described in Figure. 2.6 in section 2.4.4, the unit of analysis and sub-units demonstrate that the use of an embedded case study is most appropriate to deliver the outputs of the study. Within the PPP projects, the study examines, sustainability, within PPPs mainly VfM, RT and Innovation. The objective of the investigation is to identify the inclusion of sustainability within this procurement method and how it influences the outcome of the project. Hence the embedded unit of analysis design was compatible with the research needs.

Combining the two features, a multiple embedded case study approach is adopted in the case study design. Figure 2.7 depicts the various types of design case studies identified by Yin, R. (2009).

The two projects are comparable Irish school projects. The technical performance requirements, as provided by the Standard PPP contract documents and the Standard Output Performance Specifications, are identical in each case. The two projects are however, differentiated by various other features, for example, even if the project sponsors were the same, the client representatives are different, projects in each bundle are located within different local authorities, the project sites are different and the technical representation for each bundle was different.
Therefore, the project objectives are identical but the mechanisms for achieving these objectives via the individual PPP project are sufficiently different at the project level. Therefore, in this research the four case studies, when analysed at the project level, are sufficiently different to satisfy the criteria for being multiple-case embedded design as shown in Figure 2.7 above.

Figure 2.7: Basic Types of Designs for Case Studies (Adopted from Yin, R. 2013)
2.4.9 Case Study Design Framework

The framework in Figure 2.8 depicts the various stages in conducting the case study research. The four stages have a specific focus which contributes to the overall objective of the research. The four stages are literature review; identification and design of case study, case study data collection, and analysis and conclusions.

![Case Study Design Framework Diagram]

*Figure 2.8: Framework for multi-case study approach*  
*(Adapted from Yin, R.K. 2009)*

This research will provide a holistic study on the three-pillar sustainability model as it relates to the PPP schools project.

2.5 Research Strategy

A strategy is a planned approach towards achieving a desired outcome. It is defined as ‘a plan of action designed to achieve a long-term or overall aim’ (Hoyle, R. 2013). A Plan has specific actions which are guided by the thought process. These thought processes
can be channelled depending upon the strategies used. Qualitative and quantitative are two strategies used in a research to achieve the results that reflect the respective strategies. Due to specific characteristics it is important to understand how each strategy will influence the research. A qualitative strategy explores the perception of the subjects being researched and generates the theory based on the findings. Whereas a quantitative strategy focuses on obtaining accurate findings as well as to how the findings support the theory (Fellows, R. & Liu, A. 1997). Table 2.3 clearly identifies the difference between the two strategies.

**Table 2.3: Alternative Qualitative and Quantitative strategies** (adapted from Creswell, J.W. 2009)

<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Studies</td>
<td>Survey research</td>
</tr>
<tr>
<td>Ethnography</td>
<td>Experimental Research</td>
</tr>
<tr>
<td>Grounded Theory</td>
<td></td>
</tr>
<tr>
<td>Phenomenological research</td>
<td></td>
</tr>
<tr>
<td>Narrative research</td>
<td></td>
</tr>
</tbody>
</table>

Both strategies have specific characteristics, the suitability of the strategy is linked to the research problem, personal experience and targeted audience as suggested by Creswell, J. (2013). Saunders, M. (2009) on the other hand states that the strategy is influenced by the research question(s) and objectives, philosophical underpinnings, the body of knowledge of the researched area and availability of resources. The main differences between the two strategies are listed in Table 2.4 below.
Table 2.4: Main differences between Qualitative and Quantitative research strategies  
(Adapted from Bryman, A. 2008)

<table>
<thead>
<tr>
<th>Principal to the role of theory in relation to research</th>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epistemological</td>
<td>Interpretivism</td>
<td>Positivism</td>
</tr>
<tr>
<td>Ontological</td>
<td>Constructionism</td>
<td>Objectivism</td>
</tr>
</tbody>
</table>

Distinctive set of research methods are reflected in qualitative and quantitative strategies. These methods are methodical in nature and are used for data collection, analysis and interpretation (Creswell, J. 2013) in order to obtain information that will be transformed to knowledge, which will illuminate the research problem. A snap shot of the variations between the two methods are listed in Table 2.5.

Table 2.5: Differences between Qualitative methods and Quantitative methods  (adapted from Bryman, A. 2008)

<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Words</td>
<td>Numbers</td>
</tr>
<tr>
<td>Participants point of view</td>
<td>Point of view of researcher</td>
</tr>
<tr>
<td>Researcher close</td>
<td>Researcher distant</td>
</tr>
<tr>
<td>Theory emergent</td>
<td>Theory testing</td>
</tr>
<tr>
<td>Process</td>
<td>Static</td>
</tr>
<tr>
<td>Unstructured</td>
<td>Structured</td>
</tr>
<tr>
<td>Contextual understanding</td>
<td>Generalisation</td>
</tr>
<tr>
<td>Rich deep data</td>
<td>Hard, reliable data</td>
</tr>
<tr>
<td>Micro</td>
<td>Macro</td>
</tr>
<tr>
<td>Meaning</td>
<td>Behaviour</td>
</tr>
<tr>
<td>Natural setting</td>
<td>Artificial setting</td>
</tr>
</tbody>
</table>
In this research context the paramount importance is to focus on the research attributes as indicated and implementing the appropriate strategy to attain the results that meet the aim and objectives of the research.

This research is based on a qualitative strategy. Thus, as indicated in Table 2.4, the strategy is supported by an interpretivism epistemology and a constructivist ontology. An inductive process is used in terms of theory building. Hence the theory is developed from the data. The research problem of this study is to determine if PPP procurement route support the implementation of SD principles in construction of school projects in Ireland. The research problem at hand is one that is phenomenological and contemporary in nature. The reason being, the implementation of SD in PPPs is to be studied using PPP school projects in Ireland. This study will help to determine the underpinning factors responsible for inclusion of SD in building projects. The study seeks to capture the cause and effects of the participants that influence the way PPPs are managed and operationalised.

The research is using a case study framework. This approach is clearly supported by the philosophical stance of the researcher and the qualitative strategy. The reasons for adopting such a framework and the design of the framework will be deliberated in detail in the next section.

2.6 Research Method

As stated by Bryman, A. (2009), a research method is a technique of collating data. Creswell indicated that the research method describes mainly the forms of data collection, analysis and interpretation used by a researcher. The importance of these three elements to case studies is also highlighted by Robson, C. (2002)
2.6.1 Case Study approach
The research problem in hand, along with the research questions, are indicators of the suitability of the type of research method to be used. Yin, R. (2013) indicated the research questions in the manner of ‘how’ and ‘why’ are best tackled using case study, experiment and survey. He also states that the three methods can be used on a case which is contemporary in nature. Further evaluation of the three methods shows that an experiment restricts the impact of the real life setting by means of creating a controlled environment to measure the variables that are of focus. Conversely the survey method has limitations to the context of the study based on the practicality of the method when dealing with respondents.

Zikmund, W. (1997) noted that the advantage of using case study is the ability of the method to obtain depth and detail surrounding the subject matter. Given that the setting is of real life, the causal relationship between cause and effect becomes more meaningful to the case at hand.

The research journey to determining the research aim, justifies the suitability of the use of case study method. The PPP procurement route will assist in establishing the relationships surrounding sustainability. Consequently, it will determine the significance of sustainability and identify the contributing factors. Furthermore, the contemporary setting allows for the richness in data generation. This coherently permits an holistic and meaningful categorisation of real-life events within the PPP projects with regards to sustainability.

2.6.2 Case Study – Strengths and Weaknesses
Yin, R. 2013, states that the case study method has its strengths and weaknesses. However, case studies have been used in a wide area of study relating to social science disciplines such as social, political, economics, psychology, sociology, anthropology,
business, nursing, education and many more. This shows the versatility of this method. Understating the strengths and weaknesses of this method will help in ensuring the reliability and validity of the method.

2.6.2.1 Weakness or limitations

Yin, R.K. (2009) identifies the following as weakness or limitations of case study method.

- Lack of firmness of case study research
- Scientific generalisations
- Duration of case studies
- Validity of causal relationships

R.K. Yin also states that lack of firmness within case study research is mainly due to the unpreparedness of the researcher in executing the case study research according to systematic procedures. It is also pertinent that unlike other well-established research methods, the case study method has a scarcity of literature and procedures (Yin, R.K. 2009). However, Zikmund, W. (1997) states that lack of standardised procedures within case study is seen as a form of flexibility rather than impediment. The case study research can be further compromised by researchers’ bias and personal beliefs in leading to the outcome of the study. Zikmund, W. (1997) indicated that the success in a case study research lies in the alertness, creativity, intelligence and motivation of the researcher.

Zikmund, W. (1997) cautioned generalisation from a few cases due to uniqueness of cases. However, he also supports that the insight obtained from one case can provide direction for future research. Similarly, Robson, C. (2002) agrees to the ability of generalising using case study beyond the research setting.
Saunders, M. (2009) identifies two approaches in case study mainly cross-sectional and longitudinal studies. The cross-sectional approach provides a snapshot of the phenomenon at a particular time, compared to the longitudinal approach which is focused on evolution within the study. Case study research can be implemented using the cross-sectional approach by means of interview (Saunders, M. 2009).

Validity is the reflection of the trustworthiness of the research findings and if the causal relationships between variables are truly a representation of the real life setting as claimed by the researcher (Saunders, M. 2009). Robson, C. (2002) addressed some of the pertinent issues relating to validity. Embedding validity within the research process draws the need to ensure sustainability as part of the research design. From a case study context, Yin, R. (2013), Stake, R.E. (1995) and Robson, C. (2002) have developed robust case study procedures through time which provide an element of firmness and validity.

2.6.2.2 Strengths

The strength of the case study research lies within the context in which it is used. This notion can be generic to all research methods followed in natural and social sciences. Hodkinson, P. & Hodkinson, H. (2001) has identified the benefits of a case study as a research method, these are listed below:

- Understand complex inter-relationships
- Case Studies are grounded in “lived reality”
- Facilitate the exploration of the unexpected and unusual
- Multiple case studies can enable research to focus on the significance of the idiosyncratic
- Show the processes involved in causal relationships
- Facilitate rich conceptual/theoretical development
The design of case studies is focused to be specific in their application. Thus, it is important to identify and understand the primary objective before using this method. Yin, R. (2009), also agrees to the idiosyncratic need of this method to understand the complex social phenomena. Undertaking a contemporary research problem is another strong characteristic of case study research (Robson, C. 2002). The experiences of the organisation, individuals or groups provide richness in information that forms the causal relationships. Thus, allowing the researcher to understand the ‘how’ and ‘why’ while making sense of the occurrence of events as well as what led to it.

Case studies can be exploratory and explanatory in nature (Yin, R.K. 2009). When this method is used to understand the research problem in depth, it can also uncover unexpected & unusual findings in relation to the case which could allow development of new knowledge. In some cases, the findings can also allow to challenge existing theories. Case studies can be single or multiple and their application depends mainly on the uniqueness, focus of study and the research design. The rational for using single or multiple case studies has been well documented by Yin, R. (2013). Multiple case studies allow replication, through which significant characteristics can be tested using theoretical propositions. Combining the two elements strengthens the analytical generalisation. Please also refer to section 2.4.8.2

Zikmund, W. (1997) states, the primary advantage of case study research is that the subject can be investigated in-depth and to greater detail. In real life, examination in detail can enable the researcher to document the sequence of events as they occur or occurred over a period of time. This will allow the researcher to depict the processes used to build the causal relationships. Case studies provide a rich atmosphere for conceptual and theoretical development. Existing theories can be challenged using the complexities of the real life setting to capture the evolving changes that occur due to both the endogenous
and exogenous factors surrounding the problem. Hence allowing for new knowledge and theories to be generated and further tested.

2.6.2.3 Types of Case Study

Saunders, M. (2009) states that case studies can be divided into exploratory, explanatory and descriptive. Yin, R. (2013) also referred case studies using the same approach. Robson, C. (2002) acknowledges the three and adds another category, emancipator which captures real life view point. However, C. Robson states that whilst all four classifications may be present within a study at one time; nevertheless, one will prevail over the others. A summary of the case study characteristics is shown in Table 2.6.

Table 2.6: Classification of case study research characteristics.

<table>
<thead>
<tr>
<th>Classification of Case Study</th>
<th>Exploratory</th>
<th>Explanatory</th>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>To find what is happening</td>
<td>Seek an explanation of a situation or problem</td>
<td>To portray an accurate profile of persons, events or situations</td>
<td></td>
</tr>
<tr>
<td>To seek new insights</td>
<td>To explain patterns relating to the phenomena</td>
<td>Requires extensive previous knowledge of the situation</td>
<td></td>
</tr>
<tr>
<td>To ask questions</td>
<td>To identify relationships between aspects of the phenomena</td>
<td>May be of flexible and/or fixed design</td>
<td></td>
</tr>
<tr>
<td>To assess phenomena in new light</td>
<td>May be of flexible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To generate new ideas and hypothesis for future research</td>
<td>and/or fixed design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almost exclusively of flexible design</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this current case study, the Robson, C. (2002) viewpoint has been adopted which states one or more case study approach may be used, but only one will be predominate. This has been seen in the current research undertaken, where both exploratory and explanatory characteristics influence the course of case study, however exploratory is prevailing over explanatory.
During the initial period of this research, the explanatory component played a major role in understanding the inclusion of sustainability in the context of PPP school projects from a public sector perspective. The exploratory element is used to understand and explain how sustainability is incorporated and implemented within the PPP project environment.

2.7 Research Analysis

In this section the raw data collected from the field work will be analysed into information. This information is then converted into knowledge before it can be used by the targeted audience. This information which is still in raw form is processed into patterns, trends and concepts to generate holistic knowledge.

This section will deal in detail with the key elements associated with source of data, data collection and data analysis.

2.7.1 Data Source

In relation to this research the main source of data was from two distinct sources; firstly, from journals, reports, articles and others, and secondly, from interviews conducted and observations made.

Below listed is the source of data for this research:

a) Printed material
   • Journals
   • Reports
   • Articles
   • Project specific information
     ○ Project agreement (confidential documents)
     ○ Output specification (confidential documents)
     ○ ITN documents (confidential documents)
     ○ Periodic reports

b) Interviews
An interview format was developed keeping in mind the duration of time required for each interview which was (1 to 2hrs). This was done to avoid any disruption during the interviews when conducted. At the time the interviews were conducted, there was a limited number of personnel available to interview as the topic was still evolving and not many had the working knowledge of the same. Six interviewees were selected based on their knowledge of the subject, top management position in the organisation to influence change and expertise in the subject alongside with their availability and willingness to participate in the research. Two interviewers were willing to participate in pre-testing the questionnaire. Finally, six interviews were conducted representing public as well as private sector. A set of relevant information containing research brief, authorisation letter, interview questions, ethical approval form and other important material was presented to the interviewee for ease of reference.

The interview questions were tested through a mock-interview with three different persons in the classes of respondents. The pre-testing interviews were to test whether the final interview questions would be most appropriate or not. The process culminated in the adjustment of the research questions and the streamlining of its components before it was presented to the actual respondents.

At the start of the interview, the background of the interview respondents was noted along with their involvement in the PPP school projects. The selected respondents were all directly related to the PPP school projects.

Information was also gathered by participating directly as an observer on the two case study projects. This was done through site visits, meetings and work routine. As suggested by Yin, R. (2013) the evidence provided by observations becomes supporting information.
to the main data. The above data source helped in providing a comprehensive environment in which information can be generated. This assisted in meeting the requirements of data triangulation by maintaining the validity and reliability.

2.7.2 Data Collection

The technique used to gather data in a study is associated to data collection. This is primarily done by two main sources, primary data and secondary data.

2.7.2.1 Primary Data – Documentation

Printed materials used was from reliable sources such as research journals, newspaper articles, government published reports, national reports and books, as well as confidential documents in relation to the case study projects. The internet was used to access as much of the primary information as possible online through facilities such as the DIT library. There is very limited information available on the research topic, thus information in relation to the case study was extracted mostly from the confidential documents available from the public authority. Limited information was also gathered from public authority reports available in public domain along with respective websites such as Department of Education and Skills (DoES), National Development Financial Agency (NDFA), local authorities, school websites etc. The primary and secondary data were used to complement each other to achieve triangulation as a component of validation.

2.7.2.2 Secondary Data – Semi Structured Interviews and Observation

According to Robson, C. (2002) there are three types of interviews; structured, semi-structured and unstructured interviews. Kvale, S. (1983) views interviews as a mode used by two people to exchange opinions in which both have a mutual interest. Robson, C.
(2002) and Kvale, S. (1983) concur that interviews are widely used in the field of social science. This technique is extensively used in qualitative research (Bryman, A. 2008). Semi-structured interviews were used to collect data in this study. Kvale, S. (1983) defined semi-structured interviews as an interview whose purpose is to obtain descriptions of the life-world of the interviewee with respect to interpretation of the meaning of the described phenomena. One of the strengths of the semi-structured interview is its flexibility that can influence the sequence as well as its progression based on need. At times, when the respondent’s background in relation to the research in hand would allow, adjustments were made to the research questions in order to get the full benefit from the interview.

The pre-testing interviews were used to test the questionnaire and were refined based on the research objectives, research question, case study proposition. This exercise helped in extracting the relevant data in relation to the topic of research.

Each interview lasted approximately one hour and was voice recorded for future reference. At the start of each interview, the respondents were provided with relevant information along with a brief explanation of the context of research topic. These interviews were transcribed, a sample attached in Appendix 4. Each transcript was returned to the respondent to verify the content before analysing the data. The respondents were directly involved in the two bundle of PPP school project as used in case studies undertaken as part of this research.

Notes were taken of observations during site visits, meetings and at interview sessions. These observations were used to verify the respondents’ comments and helped to contribute to the research findings. It also provided an alternative method of gathering and verifying data.
2.7.3 Data Measurement

Prior to data collection it is best practice to identify components that need to be measured. This will help identify the appropriate measuring techniques to be used in the study. It will also make the research more focused and improve the accuracy of data collection.

The objective of the study is to develop a conceptual model to include the social, environmental and economic sustainability on a PPP school project. However, this is subjective in terms of how the parties involved perceive it. Thus, an appropriate measuring technique is required to capture the attitude of the respective parties towards sustainability within a PPP school project environment.

A hypothetical constant (Zikmund, W. 1997) is developed to indirectly measure the attitude of the participants’ perception of sustainability within a PPP project environment. The two main data measurements are the degree of sustainability incorporated in relation to social, environmental and economic parameters and the relationship between sustainability, VfM and Innovation in a PPP school project environment.

2.7.3.1 Relationship between Sustainability to VfM, RT and INNOVATION in a PPP project environment

The first data measurement method is the constant-sum scale. This method is used to identify and verify the relationships between VfM, RT and Innovation in relation to social, environmental and economic sustainability within the PPP project environment. Respondents are requested to distribute an allowance of 100 marks among the three components to reflect the relative importance of each component as illustrated in table 2.7 below:
Table 2.7 Relationship between Sustainability to VFM, RT and INNOVATION in a PPP project environment

<table>
<thead>
<tr>
<th>Sustainability</th>
<th>Value for Money</th>
<th>Risk Transfer</th>
<th>Innovation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Economic</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

2.7.3.2 Inclusion of Sustainability (Social, Environmental, Economic) in a PPP School Project.

The second data measurement method is the Likert Scale ratings method. This method is used to determine the respondents’ opinion towards the sustainability inclusion in a PPP school project stages. A seven-point Likert scale has been identified to represent the degree of sustainability which comprises of three parameters social, environmental and economic and the rating is None (1), Very Low (2), Low (3), Moderate (4), High (5), Very High (6) and Extremely High (7). The neutral point of the Likert scale is omitted to get a clear response from the respondent (Page-Bucci, H. 2003). The role of the neutral point no doubt has mixed views among researchers (Eysenck, H.J. 1998; Dumas, J. 1999) nevertheless the design of the scale should be based on the research problem.

Respondents are requested to determine the inclusion of sustainability at various stages in a PPP project by selecting a number from 1-7 which corresponds to the qualitative description respectively. The life cycle of the PPP project is divided into seven stages. The evaluation is carried out on the three main processes VfM, RT and innovation in relation to social, environmental and economic sustainability. Refer to Figure 2.9.
2.7.4 Data Analysis

Important data collected should be processed through an appropriate set of procedures if it is to be analysed correctly. The data collected during this research is of non-statistical nature as it is qualitative in nature. Qualitative data analysis procedures are used to analyse and transform data into meanings and finally into theory (Saunders, M. et al. 2009).

Content analysis procedure was extensively used to analyse data obtained from documentation. Bryman, A. (2015) defined content analysis as an approach to analyse documents and texts that seek to quantify content in terms of predetermined categories and in a systematic and replicable manner. This was carried out by examining documents from varied sources to generate categories in which data can be classified.

Data generated by the interviews were transcribed before analysing them to have a standardised approach. The interview data are also subjected to content analysis and
inductive reasoning. The inductive process allows for theory to be generated from the findings from the interviews.

Data generated from the case studies were also subjected to pattern matching and explanation building. The purpose is to identify the critical success factors (CSFs) for sustainability inclusion within a PPP project environment. Subsequently these two techniques will also be used to identify the parameters specific to the conceptual model which will be derived from each case study respectively.

2.8 Data testing

Data testing is carried out to ensure that data generated from the research satisfies the validity and reliability requirements. As described earlier, three types of validity testing – construct, internal and external validity, were considered in this research. According to Yin, R. (2013) a number of case study tactics and tests are available to facilitate different research phases.

The construct validity was achieved by use of multiple sources to produce a chain of evidence that could be included in the case study report. Thus, different sources of data were used to verify the case study report to meet the requirements to achieve construct validity.

In the case of internal validity, pattern matching and explanation building was used. Pattern matching identified the CSFs for sustainability whereas explanation building is used to develop the conceptual model.

The external validity enables the findings of the case study to be generalised beyond the case study itself. Thus, the theory formulated from the case study can be replicated using the multiple case study approach. With the theory being tested in each of the case studies, the validity of the theory is achieved by means of replication. This allows for the
analytical generalisation to occur. A case study protocol was used to ensure the reliability of data gathered in case of each case study used.

2.9 Validation of Conceptual Model

The significance of validation has been extensively discussed in section 2.4.7. The validation of conceptual model as developed is equally important to ensure the research has transpired from the case studies and the model is a true reflection and representation of sustainability inclusion on a PPP educational project. The PPP professionals from the industry when interviewed were also asked to validate the conceptual model through a focus group session. All the comments and feedback from these participants were recorded and analysed to improve the model were necessary.

2.10 Conclusion

In this chapter, various components that give structure to the research methodology have been highlighted and discussed in detail. In using the case study method, these elements provide the required integrity to the research approach. The validity and reliability of case study is of primary concern which has been addressed through the research design. Thus, it aims to mitigate the lack of accuracy and researcher bias that can be associated with case studies (Saunders, M. 2009; Bryman, A. 2015).

In summary this chapter provides sound reasoning and explanation for the selection of the research methodology. It describes how the qualitative approach will be used in the context of case study method as presented. Please refer to mind maps as presented in Figure 2.10.
Fig. 2.10 Mind map of research methodology
CHAPTER 3
PUBLIC PRIVATE PARTNERSHIP

3.0 Introduction
This chapter introduces the concept of PPP. It presents a short account of the history and development of PPP, followed by an outline of the context of the PPP system used in Ireland. It defines a number of additional terms and critiques the underlying principles and reasons for the utilisation of PPP in educational construction sector. This discussion leads to the identification of core principles of Sustainable Development and PPP and to the case for including sustainability principles in PPP projects. The chapter concludes with a summary of the major findings, based on the literature review undertaken in this section.

3.1 Background & Overview of PPPs
At the end of the Second World War, many changes came about which redefined the framework of trade, commerce and business in nations around the world. The deaths, carnage and destruction of property that came with the war meant that most nations around the world – including those in Europe, Asia and the Soviet Union - had a major need to reconstruct the physical infrastructure of these societies and also to redefine new structures for better management of affairs in these countries. One of the main features that came with this was the establishment of Keynesian based welfarist economic models that were used in most nations around the world (Miller, P. & Rose, N. 1990). This school of macroeconomic thought proposed that economic power must be centralised within the public sector and that the public sector ought to operate in ways that would ensure total employment, whilst promoting the welfare of members of the state (Keynes, J.M. 2006).
However, by the 1970s, numerous authorities, including Milton Friedman proposed supply-side economics, which would ensure that the public sector would be weakened, thereby promoting free enterprise and capitalism, in turn leading to the efficient use of resources by various organisations in a given state (Brouwer, M. 2012; Martin, A.P. 2013). This macroeconomic thought led to the decentralisation of governance and the promotion of property-owning capitalist measures that led to the creation of a vibrant private sector in many nations, that acted as the engines of growth in these nations (Momani, B. & Legrenzi, M. 2013). Towards the end of the Cold War, nations like Britain adopted the Friedman-based supply-side ideologies and theories in order to cut down on their public sector expenditure and promote the private sector. This is effectively the genesis of modern-day PPPs.

Since the 1990s, there has been a rapid rise of PPPs across the world. Developing governments as well as developed countries are increasingly using this procurement method to fund much needed infrastructural development. Over the past 15 years numerous governments around the world have struggled to achieve economic development and competitiveness through improving their basic infrastructure (Cruz, C.O. & Marques, R.C. 2013). PPPs are seen as an important tool for producing an accelerated and larger pipeline of infrastructure investments and catching up with the infrastructure deficit. It is rapidly becoming the preferred method for public procurement for delivering both transport and social infrastructure projects throughout the world, thus gaining importance as a vehicle to finance much-needed public infrastructure across the globe. In the average PPP project, accountability for the delivery of PPP projects is retained by the public sector (UNECE, 2008). Arguably, this is why developed and especially developing countries are very keen on PPP models. Refer appendix 1 for Global PPP deals by sector and region (OECD, 2014).
PPP contract activity reached a peak during the period between 2003 and 2007, before slowing down due to global financial crisis and recession. The global financial crisis of 2007 to 2009 made PPPs more attractive option. Moreover, the reduced availability of loans to private investors on PPP projects, along with altered risk consideration of banks and investors increased the cost of loans. The temporary slowing down of demand growth due to higher costs for PPPs has increased pressure on price and margins, along with project selectivity.

There is a divergence in definitions regarding what constitutes a PPP, thus it leads to different figures regarding the number of PPPs in the world. As such, not all the figures are comparable, but they do give an indication of the wide extent to which countries use PPPs. Figure. 3.1 indicates the PPP market over a period of 2000 to 2014. However, the actual injection of funding into PPP and undertaking of serious PPP projects commenced in 2011. This was because most construction projects and large-scale projects came to a halt in 2007 and 2009. Thus, in spite of the fact that PPP was seen as a more viable option in the late 2000s, the spike in the utilisation of PPP projects as a method of procuring projects commenced around 2011 - 2012 (Cellucci, T.A. 2013).
According to the OECD, total global infrastructure investment requirements by 2030 represents about 3.5% of the annual world gross domestic product (GDP) from 2007 to 2030. Investment in infrastructure needs to be substantially increased in most developed, developing and emerging economies to meet social needs and support more rapid economic growth. There is a widespread recognition that governments cannot afford to bridge these growing infrastructure gaps through tax revenues and aid alone and that greater private investment in infrastructure is needed (Fostering Investment in Infrastructure, OECD 2015).

There has been a significant increase in the stock of PPPs. Countries like the United Kingdom (UK), Korea, France, Australia, Portugal and Germany increasingly use PPPs to deliver services that they previously delivered through traditional public procurement. For most of the last decade, PPPs in the UK constituted approximately 12 - 15% of total
annual capital expenditure (cf. EIB, 2004; KPMG, 2007, McKinsey Global Institute, 2016; World Bank, 2018), with other countries following suit. Although governments around the world increasingly use PPPs, they still constitute a relatively small component of total public sector investment (Refer Table 3.1).

Table 3.1 – Percentage of public sector infrastructure investment through PPPs
(Source: OECD, McKinsey Global Institute Analysis 2016)

<table>
<thead>
<tr>
<th>Year</th>
<th>Australia</th>
<th>Canada</th>
<th>United States</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>2.5</td>
<td>3.0</td>
<td>1.4</td>
<td>6.5</td>
</tr>
<tr>
<td>2011</td>
<td>4.8</td>
<td>0.2</td>
<td>0.3</td>
<td>5.0</td>
</tr>
<tr>
<td>2012</td>
<td>0.6</td>
<td>3.3</td>
<td>1.4</td>
<td>13.1</td>
</tr>
<tr>
<td>2013</td>
<td>1.1</td>
<td>5.7</td>
<td>1.3</td>
<td>14.6</td>
</tr>
<tr>
<td>2014</td>
<td>10.9</td>
<td>3.6</td>
<td>0.9</td>
<td>15.0</td>
</tr>
</tbody>
</table>

Some countries do not foresee PPPs exceeding 15% of total public investment. One reason for this is the rather cumbersome process used to create PPPs (OECD 2008, McKinsey Global Institute, 2016).

Successful PPPs require an effective legislative and control framework (UNECE, 2008) and it is highly recommended that each partner recognises the objectives and needs of the other more minutely in the present economic scenario, along with highlighting the fact that PPPs are still in their infancy in most countries. It is argued that lack of processes, procedures and enabling institutions, like governance, are the main barrier to extending their use (UNECE, 2008).

Benchmarking PPP procurement (2017), collected information relating to different regulatory frameworks and institutional arrangements adopted in around 82 economies around the world. Diversity in the legal systems shows that there is no single PPP
framework that can be documented. Thus fig 3.2 gives a summary of PPP regulatory and institutional arrangements adopted in these economies around the world.

<table>
<thead>
<tr>
<th>Type of PPP regulatory framework adopted</th>
<th>Type of PPP Institutional arrangement adopted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concession and PPP Law</td>
<td>No PPP unit</td>
</tr>
<tr>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>PPP Guidelines, policies or similar instruments</td>
<td>PPP units with active role in the procurement of PPPs</td>
</tr>
<tr>
<td>11%</td>
<td>16%</td>
</tr>
<tr>
<td>General Procurement laws</td>
<td>PPP units with advising role to the procuring authority</td>
</tr>
<tr>
<td>18%</td>
<td>69%</td>
</tr>
<tr>
<td>Concession law or act exclusively</td>
<td></td>
</tr>
<tr>
<td>7%</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.2 Summary of PPP Institutional Development
(Source: Benchmarking PPP Procurement, 2017)

**PPP Regulatory framework and Institutional arrangements:**

The type of legal system (common law versus civil law) of a given economy can greatly impact on the PPP regulatory system. “common law” legal system relies on policy documents and administrative guidance materials, whereas economies with “civil law” legal systems are more likely to set up a detailed PPP framework in a binding legal document, statute or law, and to spell it out in detailed rules and regulations with legal force (Benchmark PPP procurement, 2017). However, economies with similar legal systems can have a wide range in how PPPs are regulated. From the analysis conducted, almost half (49%) of the economies measured by Benchmarking PPP procurement have adopted a law or act that specifically regulates PPPs. Whereas, when compared on bases of institutional arrangements, it found that PPP units are common among 85% of economies (Figure. 3.2).

The rationale behind using PPPs is the necessity to supplement public funds with investment from the private sector. Through this, infrastructure assets can be maintained.
Similarly, PPP brings along with it, innovation and efficiencies of private leading to service provision. The benefit of the PPP cannot be generalised as it pertains to specific project and the context in which it works (Rashid et al. 2011). However, the PPP model normally has benefits as well as drawbacks when compared with public sector projects.

### 3.1.1 Benefits of PPP

The private sector brings in expertise, increased efficiency and innovation which can produce better infrastructure, that is cost efficient and saves time across the construction and operation stages, thus raising the VfM for each of the project (Colverson, S. & Perera, O. 2011). A bidding process that is transparent for a PPP project can attract large efficient organisations into the process (UNECE, 2010).

A PPP project has the benefit of reduced costs and a shorter construction period (Rosenau, M.D. 1999; Cheung, E., Chan, A.P. & Kajewski, S. 2009). Infrastructure investment that often suffers due to insufficient funds can be addressed through PPP, as private sector financing allows investment in public infrastructure. The government also gets the benefit of a reduced burden of raising funds while implementing infrastructure projects (Department of Transport and Regional Services, 2005). An important advantage of the PPP model is the distribution of project risks between the public and private sectors based on who is better at handling it, with reference to expertise and costs. Thus, performance and productivity will be performed through this model (Zou, P.X. Wang, S. & Fang, D. 2008).

PPPs enable the private sector to participate in a venture which is secure with long term investment opportunities that have the means of being underwritten by government contracts. These agreements support the needed capital flows from private sector, in addition to providing investment opportunities and fuelling local job markets and industry. The introduction of new technologies by the private sector enables the delivery
of better infrastructure (UNECE, 2010). PPP encourages the streamlining of contracts and procurement processes resulting in improved results. The complicated and inefficient bureaucratic process along with procurement challenges can be largely avoided (Rashid et al. 2011).

Furthermore, a partnership between public and private sector can draw the strengths of cooperation and synergy from each other. This is illustrated by Figure 3.3 below, where a diagnosis is done by identifying the issue within the infrastructure in question. From there, an enquiry is made about how PPPs could be invoked to help the project to become more functional, efficient and effective by infusing technology, innovation and other standards.

**Fig 3.3: Benefits of PPPs (Source PPP reference guide ver.3.1, 2017)**

**PPP - Improved construction of new assets**

The quality of infrastructure service delivery by government entities is often constrained by limited capacity and weak management incentives. Thus, the common rationale for involving the private sector in infrastructure provision is based on the fact that the private sector is more efficient and effective at managing infrastructure construction projects and at managing service delivery once the assets are in place (Cruz, C.O. & Marquez, A.R.)
2012; De Vries, P. & Yehoue, E.B. 2012). Studies by Bauxbaum, J.N. & Ortiz, I.N. (2013), comparing PPPs and publicly-procured or run infrastructure, found that PPPs can achieve better results in both construction of new infrastructure assets and in infrastructure service delivery. Achieving these benefits and ensuring they translate into lower infrastructure costs for taxpayers and users, depends on the government structuring, procuring and implementing the PPP effectively.

**Table 3.2: Comparing PPP and Public Procurement in two different countries UK & Australia (Source: National Audit Office, 2011 & PPP Knowledge Lab, 2019).**

<table>
<thead>
<tr>
<th>Source</th>
<th>Comparison</th>
<th>Proportion of projects over Budget (%)</th>
<th>Proportion of projects with time over-run (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National audit office, UK 2003</td>
<td>Contract award to final</td>
<td>22</td>
<td>73</td>
</tr>
<tr>
<td>PPP performance, Australia, 2008</td>
<td>Contract award to final</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>National audit office, UK 2008</td>
<td>Contract award to final</td>
<td>35</td>
<td>46</td>
</tr>
<tr>
<td>PPP performance, Australia, 2008</td>
<td>Contract award to final</td>
<td>4</td>
<td>18</td>
</tr>
</tbody>
</table>


PPPPs have been found to reduce construction time and cost overruns from 15% to 50% for new infrastructure assets, compared to traditional public procurement (Huang, Z. et al. 2016). In the UK, the NAO, 2011 surveyed the proportion of PPP projects coming in over budget or late and compared this with previous assessments of the performance of publicly procured projects (Martin, A.P. 2013). PPPs out-performed public projects, particularly on cost; although the difference was lower in 2008 than in 2003. As also described in the House of Lords’ review of the PPP programme, improvements in public procurement in the United Kingdom may be narrowing the gap with PPPs (NAO, 2011).
It is interesting to note that study carried out in relation to PPPs implemented in Australia showed comparable results as stated in Table 3.2 (World Bank Group, 2016). Construction companies interviewed by the United Kingdom NAO indicated that the PPPs ‘impose a greater discipline’ in regard to cost certainty for projects (World Bank Institute, 2012). This is because PPPs usually do not allow for contract price to be adjusted for changes in costs and private financiers have greater scrutiny over the specifications of the project. Thus, PPP projects are on time and on budget, creating stronger incentives than under public procurement, where changes to project cost are often at the expense of the contracting authority. In turn, this means private companies make careful and more conservative estimates of costs in the first place (NAO, 2011; World Bank Group, 2016).

**PPP - Improved service delivery and management**

Infrastructure assets are often under-maintained, as maintenance is poorly planned, or planned maintenance is deferred throughout most jurisdictions in Europe (Cellucci, T.A. 2013). Political consideration or pursuit of personal gain often biases infrastructure expenditure towards new assets over maintenance, as described in an IMF analysis of corruption in infrastructure (Bauxbaum, J.N. & Ortiz, I.N. 2013). There have been relatively few studies on the impact of private sector participation on infrastructure operation. Nonetheless, available evidence from the UK’s NAO (2011) & World Bank Group (2016) suggests that private sector participation can improve service delivery and management, compared to government-run infrastructure services.

**PPP - Improved maintenance**

Inadequate maintenance increases lifetime costs whilst decreasing benefits. Regular maintenance is usually the lower-cost way to keep infrastructure assets at a serviceable standard, compared to the alternative of allowing quality to degrade until major rehabilitation work is needed.
PPPs can improve maintenance of infrastructure assets by improving incentives for both private contractors and governments to make quality maintenance a priority. PPP projects incorporate ongoing maintenance into a single contract. This helps incentivise the private company to build the asset to a high quality upfront, resulting in lower whole life cost thus reducing the need for maintenance. (NAO report, 2009; World Bank Group, 2016).

In case of PPP educational projects in Ireland, the unitary charge is based on the availability of the asset over time and the operator’s ability to meet specific levels of service quality. In this case, PPP contracting also forces governments to commit upfront to making adequate funding available to maintain an asset over time. This can help overcome the tendency to cut maintenance budgets down the line and thereby delay necessary maintenance and rehabilitation.

**On & Off-balance sheet**

The European Commission (EC), through Eurostat, endeavours to guarantee the proper application of European System of Accounts (ESA) in order to gather reliable and comparable statistics on the debt and deficit position of EU Member States. Since September 2014, ESA 2010 is the reference framework for implementing PPPs in Europe (EIB, 2015).

The Eurostat ESA95 Manual on Government Deficit and Debt (MGDD), in its PPP chapter, discusses the considerations that should be analysed in order to evaluate the distribution of risks between the public and private sector. In particular, if the government provides majority financing or provides guarantees covering majority financing, it would be an indication of an insufficient risk transfer to the private sector. The Statistics Office of the European Union (Eurostat, 2004) stated that a PPP design built own finance (DBOF) asset is off balance sheet and therefore does not affect the general government purposes (GGB) upfront over the construction period, provided the private sector
partner carries the Construction risk and carries either the Availability or the Demand risk. All the case study projects researched in Chapter 5 of this thesis have been implemented based on assets on the Government’s balance sheet. (Refer to fig.3.4).

Figure. 3.4: Decision Tree on DBOF PPP Contracts (Eurostat, 2004)
“In national accounts, long-term contracts such as PPPs raise the question of how to record the initial asset and how to present it in the government balance sheet or other stakeholders’ balance sheets.” (Eurostat, 2016). For political purposes, it might not be a good idea to record such PPP partnerships in the government's balance sheet since it could weigh down on government’s statistics and increase net borrowing and lending.

Under the (Eurostat, 2004) rules where DBOF PPP projects are off the Government’s balance sheet, the cost of the project counted against the GGB may be spread over the life of the PPP agreement (rather than over the construction period). In cases where it is not possible to classify a PPP as on or off the government books, other contract features can be considered, such as if the asset is supposed to be transferred from the private partner to the government at the end of the contract period at an agreed price. This event is also an important part of the risk sharing. However, the research carried out by Eurostat, in collaboration with the European PPP Expertise Centre (EPEC) and EIB (Eurostat, 2009) highlights the need for revision of these criteria to conform to recent International Public Sector Accounting Standards (IPSASB) guidance (Eurostat, 2004). The Eurostat guidelines, 2010 clearly outline moving away from the Eurostat decision of 2004 with an attempt to standardise the disclosure and reporting rules for PPP in government balance sheets.

ESA 2010 requires national accounts to use a “binary” reporting system. This means that a PPP’s asset is to be recorded either as a wholly government asset or a wholly non-government asset (i.e. its economic ownership cannot be split between government and the PPP company). As a result, when a PPP’s asset is found to be on a government balance sheet, the aggregate value of the project asset (and related liabilities) must be recorded. EPEC and Eurostat have produced guidance on how the rules should be interpreted and applied to PPP contracts in which the majority of the PPP company’s’ revenues come
from the Authority (rather than from users). This guidance also explains how the features of typical PPP contract provisions (i.e. those that reflect general market practice in the EU jurisdictions) are relevant to the application of the rules and therefore whether they influence the statistical treatment of a PPP as on or off the balance sheet of government. The guide is intended to be a tool for PPP stakeholders as they prepare and procure PPP projects, assisting them to anticipate the likely statistical treatment of a PPP with a degree of clarity and certainty.

Final decisions on the statistical treatment of PPPs remain with national statistical authorities and ultimately, Eurostat. Early consultation with national statistical authorities is recommended if the statistical treatment of a project is likely to be a determining factor in the Authority’s decision to procure or enter into a PPP contract, or when greater certainty on the statistical treatment is required. If there is doubt as to the appropriate statistical treatment for a PPP arrangement (signed or under preparation), a national statistical authority has the ability to ask Eurostat for its assessment.

It is important to stress that the guide does not deal with contracts in which the majority of the PPP company’s revenues come from users and are assessed under separate rules, set out in MGDD 2016.

Although the statistical treatment of a PPP may be an important factor in the process of deciding to opt for a PPP arrangement, the excessive focus on off government balance sheet may push public authorities to use PPPs where not appropriate. PPPs can also create an “affordability illusion” (mainly due to the deferral and spreading of public sector payments over time), which tends to be exacerbated when a project is found to be off balance sheet. The fiscal liabilities that arise from PPPs can have a detrimental effect on the relevant country’s fiscal sustainability and so they should be managed properly, e.g.
through recognition of government contingent financial commitments, limits on volumes of PPP investment (Eurostat, 2016).

3.1.2 Drawbacks of PPP

PPP projects run for a long time with the involvement of many parties resulting in complex processes when compared to normal projects. Due to the complexities in PPP, the projects may have longer negotiation periods and higher costs prior to implementation (Zou, P. X. Wang, S. & Fang, D. 2008). In the long run, PPP projects may end up to be more expensive than the standard projects with higher rate private sector borrowing compared to government rates. However, the public sector benchmark almost always increases and this could defeat the basis on which PPP might be used as a preferred option to executing public sector projects (De Vries, P. & Yehoue, E.B. 2012). Furthermore, the prescribed payments of the government to the private sector may exceed the costs of a comparative public sector facility (Colverson, S & Perera, O. 2011).

PPP projects characteristically involve higher cost for tendering and transaction, as well as for the associated contracts, which are normally complex and long-term in outlook. Although PPPs are considered to be more transparent, challenges remain in financing and agreements of PPP’s model. Information on the funding obtained from private sector may not be recorded along with the public spending. Measurement of profit, loss and costs involved from the private sector cannot be accessed easily from private sector due to confidentiality reasons.

For a PPP project to be implemented successfully, public as well as private sectors should have PPP specific capacity. Unfortunately, such capacity may not be available in all jurisdictions, either at a national or regional level. Time and experience are needed to establish the capacity, which makes it tough to rapidly scale up the PPP project. All these
factors combined raise the issues of competitiveness resulting in a reduced pool of private sector companies which have the capacity to undertake PPPs. The asset and sunk costs involved in major infrastructure projects may result in hold up of the projects (Globerman, S. & Vinig, A. 1996; Vining, A.R. & Boardman, A.E. 2008). The interest of the private sector and the public sector vary, as the former is more interested in generating profit, whilst the latter is interested in serving the need of the people (Rosenae, M.D. 1999). Failure to obtain an equitable outcome is a real threat when there is a gap between the skills of the parties, as one may undermine the other. PPP projects are also criticised by environmental groups concerning their performance in safeguarding the climate changes and sustainability concern. (The World Bank, 2013).

3.2. Defining the concept of Public Private Partnership (PPP)

PPP projects are based on the assumption that both the public & private sectors have particular skills and characteristics that provide each with advantages in undertaking certain tasks. This has created a widespread interest in the term PPP and it has become quite fashionable, both politically and socially. There are numerous claims in the press and public debates about the inherent benefits relating to the concept of PPPs.

3.2.1 Concept of PPP

The concept of PPP is difficult to define. One approach used is to first define the concept of “partnership”. Partnership is viewed as “a joint venture with shared risks and profits” (Geddes, M. 2014). A PPP is an agreement/partnership made between public and private sector partners which allows more private sector participation in provision of a facility or service that is traditionally provided by a public sector organisation (Bauxbaum, J.N. & Ortiz, I.N. 2013). This means that PPP creates a framework through which the private sector could be included, in providing various products and services to members of the
public through a public sector entity or organisation. This allows the public sector to gain access to expertise and skills that would enhance the delivery of its gains in providing innovative solutions to their processes and activities. Thus, the public sector and private sector work together as partners to improve performance through mutual objectives and devising ways of achieving continuous improvement and enhancement (Geddes, M. 2014).

In the case of PPP, “...there are several parties that combine forces to define and/or accomplish an objective” (Kuhne, T. 2010). PPP is different from privatisation which involves the handing over of a public sector entity to private entities in totality (Kuhne, T. 2010). PPP means delivering services through the combined efforts of the public & private sectors to achieve profitability for the private sector entities and effectiveness on behalf of the public sector (OECD, 2013). Therefore, PPP projects are implemented through a framework in which public sector projects are refined and improved in order to meet the needs and expectations of stakeholders thus creating a win-win situation for all parties involved, the public, private and the stakeholders. Thus, a PPP is a partnership formed between the public & private bonded by contracts for providing public assets and services based on sector regulation to achieve a true PPP (refer fig 3.5).

![Figure 3.5 PPP Concept (Source PPP reference guide ver.3.0, 2017)](image)
Globally, PPPs have played a central role in answering the pressing needs for new infrastructure development especially in the transportation, education & health sectors. Transportation is the largest sector implementing the PPP model in the world (Bauxbaum, J.N. & Ortiz, I.N. 2013). Factors that make most transportation infrastructure ideal for PPPs are firstly, the strong emphasis on the role of cost and efficiency helps to align private and public interests (Cruz, C.O. & Marquez, A.R. 2012; De Vries, P. & Yehoue, E.B. 2012). Secondly, the growing public acceptance in many countries of the “user pays” principle for assets such as roads and bridges which makes private financing easier in this sector (De Vries, P. & Yehoue, E.B. 2012). The ability to limit participation to paying customers, in the form of train tickets or bridge tolls, ensures a revenue stream that can offset all or some of the cost of provision in many countries, a format readily understood by the private sector (Bauxbaum, J.N. & Ortiz, I.N. 2013). The scale and long-term nature of these projects are well served by PPPs than a sole participation of the public sector. In case of education & healthcare sector it is the responsibility of the public sector to fund the unitary charge payment for the long-term nature of the projects based on the availability of the assets.

3.2.2 PPP Definitions

There are many different definitions of PPP. In order to conduct a thorough review, this sub-section would analyse different concepts and ideas from various jurisdictions around the world. This will help to formulate a thorough familiarisation of the concept and create a strong background on which critical analysis can be conducted in the Irish context.

The UK defines a public-private partnership as:

“...arrangements typified by joint working between the public and private sectors.
In their broadest sense, they can cover all types of collaboration across the private-

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public sector interface involving collaborative working together and risk sharing to deliver policies, services and infrastructure.”

(Her Majesty’s Treasury (HMT), Infrastructure Procurement: Delivering Long-Term Value, March 2008).

The Republic of Ireland defines a public-private partnership as:

“... an arrangement between the public and private sectors (consistent with a broad range of possible partnership structures) with clear agreement on shared objectives for the delivery of public infrastructure and/or public services by the private sector that would otherwise have been provided through traditional public sector procurement.”

(Frameworks for PPP, November 2001)

The International Bank for Reconstruction and Development (World Bank) defines public-private partnership as:

“a long-term contract between a private party and a government agency, for providing a public asset or service, in which the private party bears significant risk and management responsibility”

(World Bank Institute, 2012)

The United Nations defines a public-private partnership as:

‘Innovative methods used by the public sector to contract with the private sector, who bring their capital and their ability to deliver projects on time and to budget, while the public sector retains the responsibility to provide these services to the
public in a way that benefits the public and delivers economic development and an improvement in the quality of life’

(United Nations, 2008).

The United Nations provides a definition that is applied to PPPs on an international level. The definition goes further to state that a PPP is a “...voluntary and collaborative relationships between various parties, both State and non-State, in which all participants agree to work together to achieve a common purpose or undertake a specific task and to share risks and responsibilities, resources and benefits” (United Explanations, 2011).

This implies that the United Nations’ definition of PPP is one that brings together private and public entities at the state level in order to achieve a common objective.

Greve, C. & Hodge, G., 2010 summarise the concept of PPP as, a long-term contractual agreement ranges between 25 to 30 years, between public sector client and a private contractor. This involves private finance to build the assets by the private contractor and to recoup the investment over the life of the contract. A range of different acronyms have been adopted to describe such PPPs with the precise label applied depending on the exact roles and distribution of risks between the public and private sectors (refer to Figure 3.6).

It is a type of integrated procurement model whereby the private contractor generally contracts for all or most elements of the project life cycle. Typical, PPP arrangements include the design, buildings and operation of the asset (for example, road or school). This is a move from providing bidders with detailed input specifications to basing procurement on the basis of more open output specifications in order to encourage innovation and creative solutions from private sector.

The ability of the parties to partake in a PPP is based on the sharing of risks and the management of responsibilities. This comes with the allocation of obligations and
responsibilities that must be carried out in the best way and form possible by the appropriate parties.

Figure 3.6 Different types of PPP Contracts (The World Bank Group, 2019)

Figure 3.6 below shows the two extremes of PPPs. There is public responsibility on one extreme which involves handling contracts and service contracts for public projects. And on the opposite extreme of private responsibility, there is divestiture which is the full privatisation and gives control to a private sector entity to have full and total control over a given project.

3.2.2.1 Types of PPP

PPP arrangements come in many forms and is a constantly evolving concept which must be adapted to the individual needs and characteristics of each project and project partners. As a result, there are various types of PPPs, established for different reasons, across a wide range of market segments, reflecting the different needs of governments for infrastructure services. Although the types vary, two broad categories of PPPs can be identified: firstly, there is the institutionalised kind that refers to all forms of joint ventures between public and private stakeholders. Secondly, there are contractual PPPs (United
Nations, 2008). In contractual PPPs, the partnership between public and private sectors is based solely on contractual links. In this type of contract rights and obligations are regulated by an administrative contract whereas in institutionalised PPP there is cooperation between the public and private sectors. The public sector and a private company usually create a third company to deliver the requested service. They are guaranteed by the company’s statutes and by the shareholder’s agreement. Contractual PPPs include concession contracts and are the ones most often used.

**Table 3.3: PPP models used in various sectors in different countries**

(Amaratunga, D. Haigh, R. & Ruddock, L. 2015)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Country</th>
<th>PPP models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport</td>
<td>Australia, Canada, France, Greece, Ireland, Italy, New Zealand, Spain, UK, US, India</td>
<td>DBOM, BOOT, Divestiture</td>
</tr>
<tr>
<td>Water, wastewater, and waste</td>
<td>Australia, France, Ireland, UK, US, Canada, India</td>
<td>DB, DBO, BOOT, Divestiture</td>
</tr>
<tr>
<td>Education</td>
<td>Australia, Netherlands, UK, Ireland, India</td>
<td>DB, DBO, DBOM, BOOT, DBFO/M, integrator</td>
</tr>
<tr>
<td>Housing/Urban Regeneration</td>
<td>Netherlands, UK, Ireland</td>
<td>DBFM, joint venture</td>
</tr>
<tr>
<td>Hospitals</td>
<td>Australia, Canada, Portugal, South Africa, UK</td>
<td>BOO, BOOT, integrator</td>
</tr>
<tr>
<td>Defence</td>
<td>Australia, Germany, UK, US</td>
<td>DBOM, BOO, BOOT, alliance, joint venture</td>
</tr>
<tr>
<td>Prisons</td>
<td>Australia, France, Germany, UK, US</td>
<td>DB, DBO, BOO, management contract</td>
</tr>
</tbody>
</table>

In order to achieve results, there are various levels and procedures where cooperation occurs. There is the Design-Build where the private sector designs and builds a project but hands over the project entirely to the public sector on completion of construction. On
the other extreme, there is the Build-Own-Operate where a private agency or entity discharges the whole project but has to answer to some public sector agencies and entities since they are part of the project. In-between, there are various levels including Design-Build-Maintain, Design-Build-Control and other concessions that can occur. PPPs are based on the need to do specific things and meet specific objectives and goals. Hence, the role of PPP is to optimise various benefits and advantages.

“Public-private partnerships can combine the strengths of private actors, such as innovation, technical knowledge and skills, managerial efficiency and entrepreneurial spirit, and the role of public actors, including social responsibility, social justice, public accountability and local knowledge, to create an enabling environment for delivering high quality ...infrastructure and services.” (Roehrich, J. Lewis, M. & Gerard, G. 2014).

Innovation, technical knowledge and skills, managerial efficiency, and entrepreneurial spirit are known to promote better results and make the best of resources. Government sector entities are accused of being notoriously wasteful due to the lack of clear accountability lines (Cruz, C.O. & Marques, R.C. 2013; Suhaiza, I. 2013). PPP is put together to execute aspects and elements of a public sector deliverable and ensure that the project is conducted in ways that bring the best and highest value to the project team and members.

Thus, it is widely recognised that there is no single definition of PPPs and related accounting framework. Eurostat, the International Accounting Standards Board (IASB), IMF, International Financial Reporting Standards (IFRS) and others work with different definitions (PPP reference guide, 2014). The common theme that runs through all the different definitions is the facts that PPP is a system through which two components of the economy work together to bring innovation, share risks and achieve VfM results. Hence, PPP means the consolidation of efforts and the leveraging of the different aspects
of the economy to achieve desired ends by sharing strengths and ameliorating weaknesses.

3.2.3 Further Definitions:

Public Sector is defined as:

“The part of an economy in a mixed economy that covers the activities of the government and local authorities”, (Pallister.J and Law. J, 2006);

‘The area of the nation's affairs under governmental control’.


For the purpose of this research a public sector facility is defined as a building, structure or service traditionally provided from government funding and operated by the public service.

The Private Sector is defined as:

‘The parts of the economy not run by the government’.

(Pallister.J and Law. J, 2006);

‘The area of the nation's economy under private rather than governmental control’.


The Stakeholder is defined as:

‘A person or group that has an investment, share, or interest in a business or project’.


For the purpose of this research the term “stakeholder” refers to a group of people who are responsible for delivering the education and providing an educational facility. For the purpose of this research this definition will include The Department of Finance (DoF), DoES, The School Authorities (SA) and the NDFA.
3.3 Key main principles/drivers in PPPs

Understanding the concept & definition of PPPs allow us to outline the underlined drivers of the PPP arrangement. It was quite clear from the definition that the three key features of a PPP arrangement are Innovation, RT and VfM. Innovation is about the extent to which partners bring on technology and apply it to execute the project in efficient ways. RT is about the party in the PPP that bears risks and how risks will be transferred. VfM is about how to optimise and maximise returns from the financial resources available in the project. However, these three are also interrelated and can be dynamic in nature. If Innovation is not appropriately implemented, it can attract risk and escalate cost thus reducing VfM.

3.3.1 Innovation

One of the important aspects of involving private sector in providing public services is the expertise that comes with the private sector in terms of innovation; since the private sector is tuned to achieve greater savings by coming up with ideas to mitigate risks at design and construction stage. This stage in turn provides a facility which will have less problems during the operation stage. Innovation can be categorised by (Kim, J.H. Kim, J. Shin, S. & Lee, 2011) as follows:

- Product enhancing innovation to reduce the operation and maintenance cost.
- Cost saving innovation to maximise the profit for the private sector.

As the private sector partner is responsible for the operation and maintenance of the facility, it is in the interest of the private sector to bring innovation in design and construction which will benefit them in the long-term business venture.

3.3.2 Risk Transfer

In a PPP project environment, the public sector transfers risks to the party best able to carry it. This is done by carrying out various risk workshops to identify the risks of the
project in hand. The literature identifies three main risk categories which are as follows:

- Retained risks.
- Transferable risks.
- Shared risks.

Once these have been identified they are allocated to the party best able to handle the risk. This helps in understanding the risks of the project and also the consequence of accepting this risk by all parties involved. In a PPP arrangement design, construction and maintenance risks are generally the private sector responsibility. This places a greater responsibility on the public sector to define the required facilities at procurement stage, so they have the authority under the contract to deduct amounts for non-availability of the facility. In this way, the public sector achieves VfM for the tax payers.

In principle risk allocation in PPPs can seem straightforward, however risks allocated to the party best able to manage it, at the lowest cost, can be challenging in implementation. Effective risk allocation requires creative and innovative thinking, customised to the unique characteristics of the project. It also requires additional guiding principles, including considering which party has the greatest incentives to undertake risk management and to minimise the financial consequences of a risk. Generic applications of this principle have resulted in more or less standardised notions of how risks should be allocated between public and private parties, to achieve greater VfM for the taxpayers.

Although the risk of making the facility available to the public sector is the private sector responsibility under the contract, the public sector is still responsible for providing the required facilities to the society. The collapse of the UK National Air Traffic Services PPP is an example of how this can occur (Shaoul, J. 2003; Jupe, Robert E. (2009).
3.3.3 Value for Money (VfM)

The public sector has the responsibility to demonstrate that they will achieve VfM on the project which is funded by the public fund. In a PPP, the public sector has to demonstrate VfM achievement at key stages of a project as highlighted in the DoF guidelines in Ireland. This is advanced by compilation of a Public Sector Benchmark (PSB) which is used to demonstrate VfM of a PPP project. PSB is “... a comprehensive, detailed, risk adjusted costing of the project elements using conventional procurement over the whole life of the project.” (DoF, 2003).

The public sector has to take decisions based on quality of service provided by the private sector over its entire life cycle. Thus, they need to adopt a whole life cycle approach to making decisions of quality of service rather than commercial factors alone.

3.4 PPP in Europe

The global financial crisis of the late 2000s affected Europe significantly. However, Europe set up a lot of projects in the PPP framework during this period. These projects were executed after 2011 when the financial crisis eased up (Calleja, A. 2015). The PPP market in Europe was growing in size over the last two decades and in 2005-06 the PPP market increased in size by 37% from the 2000 – 2004 levels (Piper, D. 2007). This continued to expand until 2011-12 when levels of PPP were 28% higher than the average PPP levels from 2001 to 2010 (EPEC, 2019).

High growth in PPP between 2001 and 2010 occurred in transport, healthcare, education and defence sectors (Calleja, A. 2015). Figure 2.7 shows the top ten countries ranked in order of the capital value of the projects and number of deals. In terms of capital value on top of the list is UK followed by France and on the 7th position is Ireland. However, when compared in terms of number of deals, Ireland ranks 6th.
PPP are part of the European Union’s (EU) rules and directives designed to create and maintain a better system and procedure for completing projects in order to achieve desired results. There are three main objectives of PPP in the EU and they include:

- Delivering high quality infrastructure projects.
- Providing services to the public.
- Finance innovation (EC, 2011).

These three objectives have formed the basis of various directives by the EC aimed at getting public sector entities to use various competitive methods to involve the private sector. The procedure includes amongst other things, various approaches of ensuring transparency and fairness in selection and monitoring of operations and activities.

The European PPP markets are evolving rapidly with the transfer of know-how both on the public and private sector sides (EPEC, 2019). This does not mean that all projects are structured in the same way across sectors and borders - governments are developing structures which suit their own environment. This has a large scope which ranges from the legal framework, public expectations through to commercial practice. The momentum behind PPP as a globally accepted form of infrastructure and public service procurement by government has far exceeded expectations.

In Europe Figure 3.7 clearly shows UK as leading average PPP activity followed by France and 8th is Ireland (EPEC, 2019).
PPP projects have been launched across a wide range of sectors in Europe. In recent times, apart from transport infrastructure projects, there is an increasing demand for healthcare and education projects in Europe (EPEC, 2019). Defence, telecommunication, environment, public order and safety, recreation and culture, and general public services amount for the remaining projects. According to EPEC, 2019 infrastructure projects constitute the largest sector by value, but education sector is largest when compared to the number of deals followed by healthcare in Europe as illustrated in fig.3.8.
There is concern that an overheated market may lead to less rigorous evaluation of projects and less well-defined deals which may deliver short term benefits, in terms of completed projects, but in the long run will devalue the currency of PPP. Thus, parties involved in the PPP process should follow a strict corporate governance of projects to ensure a sustainable market (International Financial Services London (IFSL), 2009). The need for maintaining transparency in the entire PPP project cycle and stakeholder interactions has been highlighted as a key factor in determining the success of PPPs. The private sector has urged the government and other public sector project sponsors to be cautious of the ‘selection by nomination’ procedure, which is not the same as transparently awarded PPP contracts (UNECE, 2008).

EU law generally creates a supranational regulatory system that sets out guiding principles to which national legislations should adhere. In relation to public-private partnerships, the Green Paper on public-private partnerships and community law on

*Fig 3.8 – Evolution of the Main PPP Sectors (2014-2018) Europe (EPEC, 2019)*
public contracts and concessions /* COM/2004/0327 final */ issued by the EC sets the framework for PPP project best practice. Thus, allocation of responsibilities is up to each country defining legal responsibilities and institutions with a view to:

- Decide which level of Government will be responsible for each sector of infrastructure e.g. Ministry of Education – relationship with Ministry of Environment.

- Decide level of Government responsible for issues such as tariff setting, quality for each sector.

- Create legal instruments that allow this to happen and adequate power to each level of Government.

Prior to 2007, there were no specific provisions in relation to PPPs. Given the increasing use of PPPs, the EU Commission decided that specific regulation needs to be in place for implementing PPPs.

The EPEC was launched by the EIB and EC on 16 September 2008. EPEC is collaboration between the EIB, European Union Member and Candidate States and the EC, which is designed to strengthen the organisational capacity of the public sector, to engage in PPP transactions. EPEC allows PPP taskforces in EU Member and Candidate countries to share experience and expertise, analysis and best practice relating to PPP transactions. EPEC synthesises the experience of its members and disseminates this as practical and operational guidance.

The first step in establishing a sound PPP framework is to articulate its PPP policy. PPP policy is a government’s statement of intent on the use of PPPs as a course of action to deliver public services and the policy is the guiding principles for that course of action. Governments pursue PPP programmes for different reasons. Some countries begin using
PPPs in a particular sector, simply as a way to meet investment needs given fiscal constraints and some do it to resolve a crisis.

There is also the European PPP Expertise Guidelines that has four main phases of standards for the attainment of compliance in PPP projects including

1. Project identification.
2. Detailed preparation.
3. Procurement.
4. Project implementation (EPEC, 2019).

Many governments issue a PPP policy statement or document to communicate to the public and potential investors the government’s intention to use PPP and how PPPs will be implemented. Other countries incorporate these elements of PPP policy within PPP laws and regulations, or guidance material.

PPP policies often set out implementing principles — the guiding rules, or code of conduct, under which PPP projects will be implemented. These principles set out the standards against which those responsible for implementing PPPs should be held accountable. Principles are often supported by regulations and processes, detailing how the principles will be put into practice.

In Europe, the new directive makes the use of PPP easier by the introduction of the new contract award procedure known as Competitive Dialogue. Competitive Dialogue is intended to be used more frequently and is easier to justify than the negotiated procedure in the existing directive. Its use is for “particularly complex contracts” where a Contracting Authority considers that use of the open or restricted procedures (requiring pre-determined specifications) will not allow the award of the contract. Unlike the negotiated procedure (the award procedure generally used now in such situations), it is not necessarily to be
used only exceptionally. The Directive envisages that the Competitive Dialogue procedure could, for example, be used to award contracts for integrated transport infrastructure projects or large IT projects or with complex financial and legal structures which cannot be determined in advance of the tender process.

Competitive Dialogue ensures that projects are completed by persons who have the highest and best competency for the completion of projects. This includes the opportunity for tenders to be allowed in order to get the best and most impressive stakeholders to participate in the projects and deliver the best results.

The EC believes that Competitive Dialogue, clearly gives the public sector the freedom to negotiate the technical, legal and financial aspects of public contracts, this is particularly well adapted on PPPs and shall provide the necessary legal certainty and confidence in long-term PPP-type contracts. This contrasts with the narrower view taken by the Commission about the permissible uses of the negotiated procedure, namely that it applies principally to technical aspects of the contract and not, strictly, to legal and financial aspects.

Since the launch of Private Finance Initiative (PFI) in 1992, the UK has become the undisputed world leader in the use of PPP, with in excess of 536 projects reaching close by 2009 (EPEC, 2019). PPP has become increasingly popular as a procurement method in Italy, Ireland and Portugal with several projects at the operational stage in these countries. PPP use is continuing to become established in other European countries and is likely to expand particularly in the countries that joined the EU in recent years.

3.5 PPP in Ireland – Origins and Evolution

3.5.1 The Credit Crisis
The first PPP in Ireland was introduced on a pilot basis in 1999 (Hearne, R. 2009). Refer to a list of all PPP projects implemented appendix 2. Ireland, like many other countries experienced challenging budgetary and economic circumstances during the 2007–2009 Global Financial Crisis. As of 2009, the government invested substantial exchequer resources in capital infrastructure with €7.3 billion allocated for the capital projects in 2009 and some €31 billion designated to be allocated equally each year for the period ending in 2013 (European PPP report, 2009). The actual spending was €32.5 billion by the end of 2013 and a further projection of €42 billion from 2016 to 2021 (Hennigan, M. 2015). PPPs are a part of the government overall strategy to deliver on investment priorities. The government is committed to continuing with the PPP process as a viable procurement option for appropriate projects.

Ireland’s growth has been historically based on a strong public sector which dominated the delivery of infrastructure. This has come with fundamental issues, like poor utilisation of resources and major challenges including the waste of resources in many facades (Brouwer, M. 2012).

It has become almost routine for the public sector to require stimulus packages to balance its resources in order to meet the various ends and objectives of institutions (Reeves, E. 2012). The past trend of getting public sector entities to spend all the money they received from public funds and request for subventions gave impetus for the creation and maintenance of a system in which the private sector could be included in the activities of the public sector (Hearne, R. 2009). A total of €2.5 billion was put together and injected into the Irish economy in the early 2000s through the PPP model (Reeves, E. 2012). This marked the turnaround period for the Irish public sector and its related entities and activities since it was a departure from the National Development Plan (NDP).
Initially, the Central PPP unit of Ireland operated as a fundamental public sector institution that supervised PPP projects and ensured they were carried out in the country through the optimal combination of resources and stakeholders. This was presented in a way and manner through which VfM was integrated to promote quality delivery.

NDFA was established on 1 January 2003 and its role was to advise state authorities on the optimal means of financing public investment projects in order to achieve VfM and to provide advice on the financing, refinancing and insurance of public investment projects, to be undertaken by means of PPP arrangement within the public sector. The NDFA operates under the aegis of the National Treasury Management Agency (NTMA). State Authorities must seek the advice of the NDFA in the following circumstances, firstly for major projects and grouped projects costing in excess of €20 million and secondly for projects costing less than €20 million, where state authorities require financial, risk and/or insurance advice. However, all project related decisions remain the responsibility of the public partners.

The NDFA Act (Amendment) 2007 extends the functions of the NDFA to control the procurement and delivery of PPP accommodation projects, thereby taking over much of the role from the Central PPP Unit.

The State Authorities (PPP Arrangements) Act, 2002 provides participation of private sector in relation to the achievement of the goals of the Irish state. Since it has become apparent that sustainability is a central element and aspect of the government’s goals and expectations, there is the general trend towards a framework of working towards sustainable growth and development of the economy.
A PPP structure is one in which the project company is supported by equity investors and lenders who form part of the consortium to develop the project through the construction and operation stages. The typical PPP structure is identified in Figure. 3.9. The project company operates through various forms of agreements and ultimately, the government implementing agency is the final authority on which all accountability devolves.

In Ireland, there was a public policy objective that was put in place after 1999 based on promoting PPP in the areas of procurement and supply in the country (Reeves, E. 2012). This led to the centralisation of the PPP system in order to provide support and assistance to various units and components of the economy, any time there was a partnership of private sector actors and public sector players (Cellucci, T.A. 2013).
Ireland’s NDFA is responsible for providing stakeholder consultations, benchmarking and other cost guidance to ensure and streamline that these partnerships formed with the private partners were discharged in the right way (Cuttatree, V. & Mandri-Perrot, X.C. 2014). This includes the various elements relevant to appropriate delivery of the project by meeting the targets set that were the main essence of PPPs. The use of the private sector in public projects in Ireland led to a trend of promoting innovation and improved/enhanced results of PPP projects (Ragazzi, G. & Rottiengutter, W. 2013).

3.5.2 PPP Project Framework in Ireland

To complete a successful PPP project, there is the need to follow a process comprising a series of stages. In Ireland every PPP project implemented needs to follow the PPP procurement stages within the Capital Appraisal Guidelines. Please refer to fig. 3.10. These comprise of the 3 main stages:

a) Appraisal stage.
b) Planning stage.
c) Implementation stage.

These stages have been further explained in detail within this section.

a) Appraisal Stage

A PPP project is often a part of a wider policy or programme (DoF, 2014). A policy is a high-level plan of action that incorporates general goals and this is proposed by the ruling government given the political power to take such decisions (DoF, 2014). An example of a policy is to provide free and compulsory primary education to a group of children below a certain age. A programme is a body of procedures and processes that are meant to come together to achieve the policy goals and objectives. A project is a single activity with a definite end in a programme and it can be achieved and measured in the specific sense. Therefore, in order to complete a project, there is the need to appraise it in terms of the general programme goals as well as the specific conditions and requirements of the
project stakeholders. In order to appraise a project, there are some key objectives that ought to be observed in order to assess and evaluate the project appropriately:

1. **Establish the policy need**: There is the need to identify the specific population that are going to be affected by the project in its totality and there is the need to identify the roles of both the public and private sector partners in relation to specific objectives and needs.

2. **Definition of Policy Objectives**: There must be objectives that will be defined after assessing the policy needs. This should include specific and measurable standards that can be achieved. Once this is done, there can be some room and an opportunity to apportion various aspects of the work between public and private stakeholders.

3. **Describe the Policy Options**: There are numerous options available for the project to be completed. Appropriately there should be an appraisal that will identify where public and private players must be brought in and what they have to do in each of the option frameworks. Here, metrics may be put in place to evaluate potential private partners where necessary.

4. **Details of the Cost, Benefits, Risks & Their Relevant Impacts**: After options are appraised and evaluated, there is the opportunity to attach costs, benefits and risks, and this can be put together and aggregated in order to draw a framework of costs and benefits for public and private entities that must be involved in the entire process.

5. **Identification of Funding Implications**: The resources available for the execution of the project must be matched against the cost-benefits that are in place. These funding implications should be brought together to provide a realistic information set that can be presented to the entire programme stakeholders and also put in context of the entire policy.
6. **Preferred Project Option:** The notification of the limitations of the resources should lead to the presentation of a series of options for public-private stakeholders and their actions. This will culminate in the choice of one or several options for the completion of the project. This will be done after examining the relative merits of each of the projects.

A project must define the cost implications and matters relating to a given project. This will also be the basis for the selection of public and private partners in a PPP project and this can help to do some initial assessments and indication.

The advent of PPP meant a new system of value for money measures are to be created in the educational sector of Ireland. This must be done through the introduction of measures that value sustainability standards and practices (Rajaram, A. 2014). These sustainability rules and regulations can be interpreted and integrated into measures and appraisal frameworks. Thus, it involves development of metrics and measures to quantify and integrate evaluation of new educational projects into new processes and systems.

**b) Planning Stage**

After the evaluation and appraisal stage, there is the need to prepare a full and comprehensive business case for a PPP project (Robinson, H. Carrillo, P. Anumba, C.J. & Patel, M. 2012). This involves detailed analysis and review of the project and the formulation of different metrics and standards in order to conduct the entire research and processes. In a typical construction project, this will include the build-up of costs and the definition of metrics and targets including discounting and the definition of some vital and important measures.

Elements of innovation and other traditional efficiency matters are often handed over to private entities, whilst the management aspects might either remain in private or public hands. This is decided in this phase and detailed drawings and evaluations are done at this
point, in order to get the project to commence and proceed as required or expected. Supply chain matters and project delivery metrics and standards are also assessed and evaluated.

At the planning stage, most PPP projects involve the selection and choice of partners. This is done through the initial identification of what needs to be accomplished and how it must be done. The planning stage also has to create a single point of reference where the different project components can be measured and reviewed (Robinson, H. Carrillo, P. Anumba, C.J. & Patel, M. 2012).

c) **Implementation Stage**

In order to achieve the main ends of PPP, there is the need for most of these projects to be conducted through a contract management model and system (Cruz, C.O. & Marquez, R.C. 2012). Contract management is mainly about the implementation and observation of specific deadlines and cost limits that have been predetermined and agreed by both the private and public entity.
Figure. 3.10: PPP Procurement Steps within the Capital Appraisal Guidelines

Framework (World Bank Group, 2012)
3.5.3 PPP Educational Building Projects in Ireland:

PPPs have been implemented in Ireland since 1990s, almost €6 billion worth of public infrastructure projects have been delivered using the PPP approach, comprising of transportation and educational (primary and secondary school) projects. (DPER, 2017).

DoES is responsible for the provision of educational facilities in Ireland. The capital expenditure of DoES mainly concentrated on providing primary, post-primary and higher education facilities, as shown below in relation to planned and actual spending from 2012-16 (Table 3.5)

Table 3.4: PPP Projects & Investments in Irish Education (DoES, 2016)

<table>
<thead>
<tr>
<th></th>
<th>DEPARTMENT OF EDUCATION AND SKILLS</th>
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<tbody>
<tr>
<td></td>
<td>CAPITAL EXPENDITURE 2012 – 2016</td>
</tr>
<tr>
<td></td>
<td>Schools</td>
</tr>
<tr>
<td>2012</td>
<td>€347m</td>
</tr>
<tr>
<td>2013</td>
<td>€361m</td>
</tr>
<tr>
<td>2014</td>
<td>€470m</td>
</tr>
<tr>
<td>2015</td>
<td>€450.5m</td>
</tr>
<tr>
<td>2016</td>
<td>€365.5m</td>
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</table>

Due to the world financial crisis of 2008, PPP activity in Ireland fell due to its own economic and fiscal difficulties (DPER, 2017). Only in 2012 the Government launched a new PPP programme with a €1.4 billion pipeline of projects comprising schools, third level education facilities, courts, primary care centres and roads. Building on this, the Government is now supporting development of a third phase of the PPP programme, with a further €500 million worth of projects to provide new third level education facilities, a new courts complex and new Garda stations (DPER, 2017).

Ireland has been investing in educational PPP projects and table 3.6 below sets out an estimate of the total annual cost of unitary payments that will fall due on all existing and planned PPP projects to 2021 (DPER, 2017).
Table 3.6: Existing & Projected PPP Educational Projects in Ireland (DPER, 2015)

<table>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Existing PPPs</td>
<td>225</td>
<td>220</td>
<td>215</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>PPPs in development</td>
<td>5</td>
<td>45</td>
<td>120</td>
<td>155</td>
<td>175</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>Total Education</td>
<td>225</td>
<td>225</td>
<td>260</td>
<td>320</td>
<td>355</td>
<td>375</td>
<td>380</td>
</tr>
</tbody>
</table>

It is anticipated that an average of over €360 million per annum (indexed for inflation) in PPP unitary payments between 2022 and 2035, followed by an average of about €280 million per annum from 2036 until 2042 is committed by the Exchequer under PPPs. This is a considerable ongoing financial commitment that will absorb a significant amount of the Government’s capital expenditure allocation. To ensure that PPP investment is affordable and sustainable over medium and long term, Ireland has capped relative the Exchequer capital envelope, which will see the total cost of PPPs, including up-front direct Exchequer costs, being limited to 10% of total annual Exchequer capital spending.

3.6 Political Economic Social Technological Legal Environmental (PESTLE) analysis of PPPs:

The PESTLE analysis helps to identify external, exogenous factors (political, legal, economic, social, technological, legal and environmental) that can have influence over the implementation of a PPP project. Thus, it helps the decision-makers to identify and mitigate the external factors that can impact on the project and take informed decision in order to plan for the implementation of PPP’s (IRJET, 2016).

The six components of PESTLE are as follows:

- **Political framework:** International, national and local will or commitment.
- **Economic:** Access to significant private sector borrowing.
• **Social**: Public acceptance of private sector involvement as well as the social needs of the facility that cannot be provided by the traditional method, due to the lack of government finance.

• **Technological**: Access and availability of quality PPP practitioners and experienced project sponsors.

• **Environment**: Clearly defined sustainability and impact criteria.

• **Legal framework**: Standardised documentation.

### 3.6.1 Political:

A strong political will from the government can only promote the commissioning of PPP projects by overcoming resistance and giving a clear signal of the government’s intention to meet its contractual commitments. The political stability of government interacts most significantly with the economic and technological components. Government stability would be a necessary precursor to the private sector lending money for the PPP projects and also for the Special Purpose Vehicles (SPV) being prepared to risk significant bidding costs in preparing a project proposal. This means managing the pressures and expectations of elected bodies, the media and other stakeholders, which often push implementing agencies for faster delivery. While political commitment is welcome and necessary, pressures for overly optimistic timelines need to be dealt with appropriately.

The driving force in promoting PPP politically in Europe is the EC, in particular the Directorate General “Internal Market”. By incentivising EU Member States to implement PPP projects, the EC aims at further opening national markets to competition, in particular the sectors of transport, public health, public safety, waste management and water distribution (City & Financial, 2008).
A public service can be delivered mainly in three different ways, firstly provided directly by the public sector (traditional delivery), secondly provided by the private sector by privatisation of public services and thirdly by PPP. In PPPs the public sector retains the overall responsibility for service delivery and is supported by the initial funding and expertise required for the project by the private sector. Thus, politically PPPs are more attractive as the government can take the credit for providing the facility now and the public will pay for the upkeep over the following decades.

Given the enormous investment requirements in infrastructure development in Europe, the need for a sustainable pipeline of PPP projects has become paramount. The private sector recognises the enormous business opportunity of PPPs in Europe and has welcomed the EU commission’s PPP initiatives. Most of the European countries have a stable political system thus making implementation easier.

3.6.2 Economic:

Effective PPP models will have to make economic sense to the parties involved for their success. Thus, it has to devolve sensibly the roles and fair sharing of responsibilities, costs, and risks between the public and private sectors. Project development needs to be done by government, for which it needs to create dedicated funds. These funds would help create a pipeline of bankable projects. PPP projects often raise debt funding on a limited-recourse project finance basis. This means that the lenders rely merely on project assets and cash flow and do not have recourse to the project sponsors. Debt finance usually represents 60 – 80% of the financing structure. Therefore, PPP design and documentation should provide adequate protection to debt service against non-commercial risks related to force majeure, regulatory changes, contract termination, etc. Risk is assigned to the partner best able to manage it. Commercial risk is better borne by the private sector partner, while regulatory risk is better borne by government agencies.
Well-prepared projects reduce the cost of bids and attract more bidders in a public tender. The management style applied to European PPP projects is commercially orientated. The projects are commercial self-contained cost centres. The typical SPV – concession holder may place the construction and operational contracts with a subsidiary in exactly the same way that they would treat any other contractor.

In the public sector the use of PPPs involves change from initial short-term capital expenditure to long-term current expenditure. For example, construction of a school building project will have an initial capital cost and a further cost of maintaining the school for the duration of its lifetime. In PPPs, the private sector bears the initial capital cost and gets an ongoing maintenance cost in addition to an agreed annual finance repayment in the form of unitary change over a period of up to 30 years. Thus, the private sector has longer involvement with the project which is extended beyond the construction phase. This draws down two main issues: one the private sector has a long-term income to maintain the accommodation and so the risk of minimising the cost of maintenance is of greater importance to the private sector in a PPP project. Secondly, the private sector is exposed to this risk and thus could have bearing on the cost of the project. It is essential that a PPP project clearly identifies the risk and reduces the attributed associated cost by identifying all risks and placing the party best able to bear such risk.

According to Kim, J.H. et al. (2011), PPP procurement is a lengthy process and could cost up to 4% more if chosen as the preferred procurement route. There is merit in this view as it can be argued that under PPP the cost of private sector borrowing is higher compared to the cost of public sector borrowing. Thus, the risk to the project itself of cost overruns and delays makes PPP more high risk compared to traditional contracting.

The EIB is the EU’s financing institution and was established to provide long-term finance for projects in support of EU policy objectives. Consequently, the bank
contributes towards the development of a closer-knit Europe in terms of economic integration and greater economic and social cohesion. Accounting and statistical rules relating to PPPs sometimes overlap and this creates some degree of uncertainty. However, EU member states have the obligation to comply with the Maastricht criteria which is evolving to cover all these grey areas. In this regard, Eurostat adopted a decision on 11th February 2004 on the deficit and debt treatment of PPPs.

Eurostat states that the assets involved in a PPP may be classified as non-governmental assets and therefore recorded off the government’s balance sheet if the following conditions are met (Eurostat News, 2004). Firstly, the private partner bears the construction risk and secondly the private partner bears at least one of either availability or demand risk (Eurostat, 2004; City & Financial, 2008). However, the Eurostat, 2010 guidelines is moving away from Eurostat 2004 guidelines. The PPP asset is to be recorded either wholly government asset or wholly non-government asset. The guidelines state that the asset cannot be split between government and PPP Company. Moreover, an excessive focus on off government balance sheet recording can create an affordability illusion which could ultimately effect value for money.

3.6.3 **Social:**

PPPs meet social needs that governments cannot honour alone due to shortfall of funds. In developed and developing countries the infrastructure deficit which is difficult to bridge means of state funds is eminent, thus making a case for the PPPs. Governments implementing PPPs need to be abundantly clear and determined about the basic motivation and objectives for opting for PPPs. As such, they create a conduit for the attainment of results along many different spectrums.

Public opposition has led to many cancellations of PPPs, both before and after the concession award (UNECE, 2008). Examples include the cancellation of several UK
hospital building projects in 2009 due to the strain on public budgets during the financial crisis of 2009 (Krumm, T (2016). The social and cultural norms within a nation can significantly alter the behaviours of people, ultimately affecting the operation of systems and structures in place. The complex nature of the PPP procurement along with a vast documentation requirement was putting a lot of pressure on the implementing authority. Because of their complexity they were also confused with privatisation and thus not readily accepted in some countries.

While resource constraints and maximizing government revenue are legitimate motivators, they should be driven much more by the core drivers of effectiveness gains such as improved service standards and customer satisfaction along with efficiency gains such as value for money and improved service at optimal costs (EC, 2004).

In Europe the acceptance of private finance in public services was slow but took momentum in the early 1960’s (EC, 2003). However, today Europe is implementing the PPP model in all sectors. This implies that PPP procurement model is widely accepted socially as it has wider societal impact.

3.6.4 Technological:

Technological changes are happening at a greater pace and thus the private sector is in constant state to change in order to maximise potential gains that become possible through the application of new technology. Culturally technological changes are slow in public sector and thus there is no immediate benefit in the level of service provided by the public sector. The collaboration of public and private sector in a PPP brings the better of the two worlds and benefits the end-user.
3.6.5 Environmental:

PPPs go through rigid and rigorous evaluations and analysis. The involvement of private partners imply that the review of each project will be done with an emphasis on sustainability based on the project brief. A well-developed impact and sustainability control regime would indicate that the PPP projects are likely to encounter more detailed scrutiny in countries with relaxed government environmental standards (Calleja, A. 2015). Europe has comparatively well-developed environmental control criteria as compared to rest of the world. In Ireland the environmental issues are a major factor in infrastructure development. The Kyoto Protocol, the National Waste Management Strategy, the Nearly Zero Energy Building (NZEB) standards etc. are bringing enormous pressure to bring Ireland in line with EU directives.

3.6.6 Legal framework:

PPPs need to have detailed policy to build confidence and attract the participation of private investors and commercial lenders. PPPs can succeed only if they are structured and planned in detail and are managed by expert dedicated teams - preferably, a single, centralised unit servicing as a ‘one-stop’ shop for investors and a nodal point for facilitating cooperation among the different government agencies. Governments also need to use technical, legal and financial advisors, where needed, to match the advantages of the private sector, particularly in large-scale programmes.

In Europe, if a PPP model is to be implemented, it must adhere to the relevant EU legislation. All the EU member states have their own national legal systems and procurement guidelines, each of which must comply with procurement guidelines. The original PPP philosophy had originated within the UK common law legal system. Translating that common law approach to other legal systems has inherent difficulties. In
some nations issues that would appear to be pre-determined, can unravel as disputes move away from the site and into the courts. A further legal difficulty within PPP is the requirement for the settlement of contractual disputes. Given the variations in the formats, bidding procedures, agreements and overall execution of PPPs among the various local bodies/ agencies, the private sector has highlighted the need for standardised prequalification and bidding procedures and guidelines for ensuring efficiency, predictability and ease of the approval process. A significant difference in the national legal approaches is the consideration of the intended longevity of relationships. In Europe the approach is broadly that each PPP contract should be treated independently as a one-off agreement. Some of the criticisms of the PPP process point to the length of the procurement process and the variety of contracts in different sectors (Gunnigan, L. 2007). The second review of the PFI by Sir Malcolm Bates (1999) called for standardisation of documents as a means to shortening the procurement process.

3.7 Case for Sustainable Development in PPPs

There are several declarations in Ireland that emphasise the need for sustainable development. This includes amongst other things, the need to develop the country with an emphasis on long-term growth and the long-term expansion of Ireland is the priority of the relevant authorities (Government of Ireland , 2016).

The national strategy for educational sector on sustainable development came in as a major tool and important element for the development and growth of the country in an organised manner (DoES, 2014). Amongst the main priorities is to use sustainable structures and systems to develop the country. This implies that the construction of all buildings and projects, including those in the educational sector, must be done in accordance with the principles of sustainable development. This means the
environmental, economic and social variables of projects must be broken down into sustainable standards and effort must be made to meet those targets.

Additionally, Ireland as a nation needs to educate their next generation with the importance of sustainable development. Hence, it is imperative for the government to relate the infrastructure development that follows the fundamental know-how of sustainability and to include the principles in the design and delivery of public & school buildings. Therefore, there is an inevitable requirement to connect sustainable development with economic decisions.

In a thorough examination of the macrocosmic framework, it is apparent that the international community, including the UN and the EU endorses sustainable development (Evans, J. Hiteva, R. Lazarova, N. & Thompson, K. 2010). This means that sustainable development is an important and vital part of social affairs. And in most cases, it is apparent that the public sector is not up to the task of developing construction projects that meet these sustainability targets. This is because there are often technical standards and targets relating to construction and other specialist activities that most nations cannot produce through their public sector (Evans, J. Hiteva, R. Lazarova, N. & Thompson, K. 2010). In other cases, these competencies could be hired by the government to ensure that sustainable development is a vital factor in all construction projects.

Sustainable development concentrates on the long-term sensitivity of projects and the need to reduce emphasis on short-term benefits, thereby getting the best of results for the society and the community over an extended period of time (Bauxbaum, J.N. & Ortiz, I.N. 2013). PPP is an holistic approach and a system through which projects are implemented that will bring better results to the society and to the stakeholder by involving private partners to contribute to the achievement of the best and most significant results of delivering sustainable development. (Moavenzadeh, F. & Markow, M.J. 2010).
3.8 Conclusion

This chapter has tried to identify a clear definition of PPP based on the various definitions and perspectives of how a PPP is perceived and viewed around the world. The definitions are the reflection of the diverse and philosophical characteristics in positioning of PPP as both a tool to provide the much-needed finance to deliver social and infrastructure projects to accelerate the economy and to bring social prosperity by sharing risks and bringing in innovation to achieve VfM.

The global financial crisis is having an impact on the funding of all capital investments, including PPP projects around the world. There is no doubt that the challenging fiscal position faced in Europe will have an impact on the overall capital spending over the medium-term. Thus, a PPP model needs to demonstrate robustness in implementation and sustainability. The PPP stakeholders have an important role to play with the contractual frameworks determining the requirements of a project along with the rules of engagement. In this chapter the concept of PPP and how it is viewed within the context of sustainable development is presented by identifying the key principles and drivers of a PPP project in a PPP environment. Refer Figure 3.11 for the process mind map followed.

The next chapter explores the challenges facing inclusion of sustainability in the context of PPPs. This then helps to identify the link and dynamics between sustainability and the three core principles of PPP - Innovation, RT and VfM.
Figure: 3.11 Mind map of chapter 3 - PPP
CHAPTER: 4

CHALLENGES FACING INCLUSION OF SUSTAINABILITY

4.0 Introduction

The previous chapter discussed and reviewed the definitions of PPP. Whilst it outlined that there is no consensus on a clear definition of PPP, there is agreement that PPPs are contractual arrangements between the government and the private companies, to introduce innovation by transferring appropriate risk to the party best able to manage it, hence deliver VfM to the public.

This chapter aims to establish whether PPP projects can be sustainable with regards to environmental, economic and social criteria. The main focus of the study is to critically analyse the framework for the delivery of educational construction projects through PPP within the EU context. Part of this process is to use Ireland as a case study to highlight examples of European current practice in the Irish PPP market, to thereby establish whether the PPP procurement route can or cannot support sustainability. To achieve the above, an analysis is carried out of the public and private sector, which are the key players in the PPP market, to identify how they can influence the inclusion of sustainability on PPP projects. Thus, to understand the inclusion of sustainability on PPP projects, this research will seek to understand the ethos and concept of sustainability in its entirety.

4.1 Sustainability: Reviewing & Defining:

The terms 'Sustainability' and 'SD' can often be used interchangeably; however, there is clear distinction between these two concepts. Sustainability means ‘the ability to sustain’ (Marcuse, Peter 1998), which often refers to an end product that can be sustained over time. On the other hand, SD refers to a process towards
achieving sustainability goals. Defining and discussing what sustainability is will provide a better understanding of the process of SD.

Etymologically, the word sustainability stems from the Latin *sub-tenere*, which was assimilated into the word *sustinere* (to hold up). Since the 1980s the concept has been used in the sense of human sustainability around the world. This has resulted in the most widely quoted definition of sustainability and sustainable development (WCED, 1987). Sustainability became popular after the publication of the Brundtland Commission of the United Nations, (1987) report and is widely used to refer to the capacity or ability of a system/project to sustain its operations, benefits and services in the long term without compromising the needs of future generations. However, many different definitions have been advanced by various authors and researchers. While many authors have sought to define sustainability in relation to the capacity and ability of a system/project to sustain itself or endure its operations, benefits and services during its projected life, others have defined it in relation to policy making. For example, in their definitions of sustainability Du Plessi, C. (2000), Barton, H. (2000), Cathy Baldwin, C & King, R (2018), particularly focus on the interaction of the economic, environmental and social aspects to achieve sustainable systems or projects.

The Brundtland Commission defines sustainability “as the ability of a system to meet the needs of the present without compromising the capacity of the future generations to meet their own needs and goals”. Many experts believe this definition meets most of the diverse aspects of sustainability in its applications (Adams, W.M. 2001; Dale, A. 2001). However, some critics have found the Brundtland Commission report definition to be problematic (Taylor, J. 2002; Jabareen, Y. 2008). In his critique of the UN definition, Taylor, J. (2002) particularly argued that it is not always easy to
determine the needs of the future generations since they are often different from the needs of the people today.

For the purpose of this study, sustainability is divided into the three pillars; social, environmental and economic. Information is gathered based on policy as a clear indicator of commitment to taking a leadership position in advocating and incorporating sustainability at global level and secondly based on SD perspective at project level.

4.2 **Sustainable Development (SD) Perspective:**

SD is one of the most universally endorsed aspirations of our time. There is abundant literature regarding the theory and concept of what SD means (UN, 1987; Elliot, J 1999; Redclift, M.R. 2005a; Jabareen, Y. 2008; World bank, 2018). Some argue that the over-utilisation but simultaneous under-theorisation of SD as a concept, means that it can lend itself to a range of very divergent goals (Le Heron, R. 2006; Marcuse, Peter 1998); others consider that its strength lies precisely in the fact that there is no centrally determined blueprint for SD and thus its meaning will have to emerge out of an interactive process of dialogue and reflection (Jordan, A. 2008; Faucheux, S. et al. 1998).

UN (1987) definition of SD indicates that it is about getting the balance right between the economy, social issues and the environment, that ultimately benefits the people to be able to enjoy economic prosperity, social progress and a high-quality environment - both now and in the future.

Sustainability can be achieved on a project if all the three pillars of sustainability have been dealt in harmony. Each of the three pillars must be sufficiently addressed in any project in order to ensure it is comprehensively and sufficiently sustainable.
Failure to balance these three aspects sufficiently could jeopardise the long-term growth and expansion of the project and could potentially render the project unsustainable. For example, the economic aspect of sustainability refers to the ability of the projects to be able to indefinitely support economic production. Environmental sustainability of a project is concerned with its ability to maintain the qualities of the environment without jeopardizing the natural resources for future generations, while social responsibility is all about how the project impacts on the general wellbeing of the society. Until a decade ago, sustainability was dominated by economic and environmental requirements because of its strong regulatory influence. The social aspect of sustainability has been largely fragmented in use as well as in literature.

As illustrated in figure 4.1 below, the two sustainability definitions well accepted in the industry are the three-pillar sustainability model and the Russian Doll model (RICS, 2007). The common theme between them is that they accept the three sustainability factors, namely: social, environmental and economic. Taking the definition of sustainability further, it is widely accepted that to achieve sustainability we must balance economic, environmental and social factors in equal harmony.

The sustainability Venn diagram in figure 4.1 depicts that if we only achieve two out of the three pillars then we end up with:

- Social + Economic Sustainability = Equitable
- Social + Environmental Sustainability = Bearable
- Economic + Environmental Sustainability = Viable

Only through balancing economic + social + environmental can we achieve true sustainability and a truly circular economy.
The inclusion of sustainability is currently one of the critical challenges facing many PPP projects. According to Jabareen, Y. (2008), the use of PPPs in the delivery of public ventures, such as school projects, is becoming increasingly popular. The UK has executed most PFI projects in the past two decades and by virtue of that, has developed PPP and PFI standards which are followed by many other EU countries.

Figure 4.1: Interaction of three pillars of Sustainability on a construction project
UK is the leading EU country to implement PPPs in educational sector. Many countries in the rest of the world including USA, Australia, Canada and Asia are now implementing PPP educational projects. Sustainability being one of the major public issues due to growing public awareness, thus it is important to take appropriate action to implement and include sustainability in the design of the PPP school projects.

In addition, there is also a case for incorporation of sustainability in PPP projects, due to its very nature of working in partnership for longer timescales, as sustainability takes into account the impacts of a project over its entire lifetime thus considering project efficiency over its lifetime period.

4.3. Social Sustainability

Although there is no universally accepted definition for social sustainability, it is often referred to as the ability of social systems to indefinitely function, by establishing a harmonious nexus between social evolution and the environment, encouraging social justice, social equity, community building and enhanced quality of life (Polèse, M & Stren, R.E. Stren (2000). Social sustainability can also be seen as the maintenance of social values such as equity, culture and social justice in a way that satisfies extended human needs and preserves nature and its productive capabilities (Colantonio, A. 2007 and Colantonio, A. & Dixon, T. (2010). Conversely, Thin, N. (2012) argues that the social aspect of sustainability particularly focuses on the need to balance individual needs of an organisation with the needs of the greater society.

Social sustainability is also achieved by setting up of infrastructures aimed at sustaining the next generation and the involvement of communities to this
sustenance. Many discussions have come up in defining social sustainability and its indicators or components (Munda, G. 2011). The topic is still open for discussion depending on specific needs of specific societies, nations or generations and thus can be tailored to individual area and communities’ requirements.

4.3.1 Global Level - Policy Perspective

Generally, social sustainability can be observed through indicators and steps of its establishment and implementation. Some of these processes include; an equal distribution to access of basic resources such as health, education, housing, transport and recreation, a balance between the current generation and the future generation, the presence of cultural relationship among communities and respect and protection of their interests, intensive participation of citizens in political events such as elections (Gibbs, D. 2010). At a global level it is critically important, as a socially unsustainable system may lead to problems like endemic poverty, low education, wars and widespread injustice. This may ultimately affect the other two pillars of sustainability. Social sustainability gained a lot of interest when BP leaked oil in US waters which impacted on the water species and human lives. Second good example is the Bhopal gas leak in India which paralysed human health and future generations of that area. These and similar cases have brought the social responsibility to the top of the agenda. Multinational organisations are now reporting on their corporate social responsibility (CSR). In this research we would look at how this topic gets transposed into the local and project level objectives.

4.3.2 Corporate Social Responsibility (CSR):

CSR refers to organisations taking responsibility for their impact on society. CSR is
the commitment of business to contribute to sustainable economic development to improve quality of life, in ways that are both good for business and good for development. Interest is growing in the potential coincidence of public sector priorities and the CSR activities of business, not least with regard to the social and environmental management practices.

The role of the public sector in CSR is a complex and emerging field. As the term “CSR” has not yet taken hold in many public sector organisations, many of their interventions have not been undertaken explicitly as CSR initiatives. Hence, there is a wealth of relevant experience among public sector agencies that is currently being overlooked.

Table 4.1: Categorises possible government interventions regarding CSR (Source World bank, 2003)

<table>
<thead>
<tr>
<th>Public Sector Roles</th>
<th>Mandating</th>
<th>Facilitating</th>
<th>Partnering</th>
<th>Endorsing</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Command and control’ legislation</td>
<td>Regulators and Inspectorates</td>
<td>Legal and fiscal penalties and rewards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>‘Enabling’ legislation</td>
<td>Creating incentives</td>
<td>Capacity building</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funding support</td>
<td>Raising awareness</td>
<td>Stimulating markets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combing resources</td>
<td>Stakeholder engagement</td>
<td>Dialogue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Political support</td>
<td>Publicity &amp; praise</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CSR is based on the concept of triple bottom line which leads to the convergence of social, environmental and economic standards in projects. The main core principal of CSR is commitment to sustainability. It aims to ensure that companies conduct their business in a way that is ethical. This means taking account of their social, economic and environmental impact, and consideration of human rights.

There has been an increased demand from employees, customers and government bodies for businesses to be more open about their activities and that they reach and
maintain acceptable standards in their business practice. Businesses are striving to hit the correct balance between fulfilment of social or environmental goals, which try to achieve their financial goals while minimising any negative impact on society or the environment.

4.3.3 Social Accountability:

Although, currently social accountability has been recognised to a very limited extent, there is an increasing debate on the responsibilities for supply chain related issues, as well as those related to disposal activities in the delivery of public projects. Life cycle methodology at the moment only covers the end user social sustainability aspects (potentially highly product specific) in a limited manner (Benoît, C & Mazijn, B. 2009). Alternatively, the social accountability debate within urban development focuses mostly on issues relevant to end users; the communities that they currently live in or will use the urban areas (refer to figure 4.2).

![Figure 4.2: Triple bottom line: adapted from Centre for Sustainable Organisations](image)

*(Benoit and Mazijn, 2009)*
4.3.4 Social Sustainability: Project level sustainable development perspective

Over the last decade social sustainability has gained a lot of importance and is currently being developed as the most important pillar of sustainability. However, it has been the most neglected aspect of the three pillars for a number of reasons; firstly, limited research was carried out on this subject, thus leading to very restricted working data available, secondly, no legal backing or, poor or no legislation is in place in relation to this initiative and thirdly, issues in relation to this subject take longer time to surface due to their nature. Latterly, alongside environmental sustainability, social sustainability is gaining considerable importance and attention. Typically, on construction projects, it runs parallel to environmental sustainability and together they can ensure that future generations will have equal access to social resources just like current generations (Thin, N. 2012). However, it is important to note that the recent EU directives stipulate that social contracts will integrate social accountability and life cycle costing.

Table 4.2 below shows a list of criteria derived from the literature review concerning social sustainability inclusion on PPP projects. These criteria can be included in the output specification to achieve social performance requirements. This list is not exhaustive and needs regular updates.
<table>
<thead>
<tr>
<th>Output specification</th>
<th>Possible techniques</th>
<th>Performance criteria</th>
</tr>
</thead>
</table>
| Community engagement | Stakeholder consultation  
Identification and empowerment of  
a ‘sustainability champion’ for the project | Public support for the project  
Levels of public participation in project  
governance arrangements: openness & accountability  
End user views are considered and incorporated; include them and make  
them feel part of the process.  
Quality of feedback from end user and public consultation;  
Degree to which end user and public preferences are reflected in project outcomes. |
| Community facilities | ‘Bundling’ profitable PPPs with less profitable ones  
(for example, a crèche to be included in a school along with recreation spaces) | Levels of end user satisfaction  
Percentage of catchment population able to access service  
Equality of access across race, religion, gender, age, disability etc. |
| Comfort & Health | Visual, thermal, acoustic comfort assessment  
Indoor air quality assessment  
Water quality assessment | |
| Safety & Security | Building safety and security assessment | |
| User well being | Quality of the building as a place to learn and interact | |
| Accessibility | Ability of users with physical impairments to use the facility  
Access to green and open spaces  
Access to public services and amenities | |
| Social cohesion | Social and ethical responsibility  
Equal opportunities for social inclusion of minorities  
Preservation and / or enhancement of cultural heritage and integrity | Levels of resident / employee and end user satisfaction  
Levels of community voluntary work  
Community diversity |
| Low carbon lifestyle | Link development to public transport  
Provide high quality pedestrian and cycle routes | Level of car use / proportion of staff & students using sustainable methods of transport to travel.  
Staff & Student / user satisfaction  
Health e.g. if policy is to improve air quality through public transport, then reductions in respiratory illnesses appropriate |
4.4. Environmental Sustainability

According to Camagni, R. Capello, R. and Nijkamp, P. (2010), the relationship between social, economic and environmental sustainability cannot be denied, as the three pillars are the main components of successful sustainability. The relationship formed in a project between social, economic and environmental sustainability will lead the project closer to achieving sustainability.

Environmental sustainability of a project is all about its capacity to maintain healthy impacts on the environment without jeopardising the resources for future generations (Reid, D.D. 2011). Generally, the main agents of habitat degradation were identified to be increases in population pressure, poverty and unequal distribution of resources. For example, an economic activity such as construction normally produces waste, which may eventually impact negatively on the environment (Reid, D.D. 2011).

Environmental sustainability emerged due to environmental degradation, the discussion for which emerged in 1960s. Generally, environmental sustainability of a project concerns its capacity to maintain healthy impacts on the environment without jeopardising the resources for future generations. In 1980s, a conservation strategy was developed by the International Union for Conservation of Nature and Natural Resources (IUCN) with the advice, cooperation and financial assistance of the United Nations Environment Programme (UNEP) and the World Wildlife Fund (WWF) to preserve nature (Reid, D.D. 2011). It was aimed at defining the main agents of environmental degradation in order to propose mitigation measures.

4.4.1 Global level - Policy perspective

Environmental sustainability is currently an important subject in construction projects, as it promotes the adoption of strategies that make it possible to use the
available scarce resources in a responsible and efficient way, in order to minimise waste, reduce greenhouse emissions, tackle climate change and provide long term benefits (Reid, D.D. 2011).

The EU has a number of directives that have scope to cover social contracts and integrate social accountability into the life cycle costing of these projects (Gibbs, D. 2010). The Energy Efficiency Directive, 2012 presented a plan to ensure that near zero-energy buildings are constructed across Europe by December 2020 (Gibbs, D. 2010).

4.4.2 Environmental Policy

Over the past century, human activities have released large amounts of carbon dioxide and other greenhouse gases into the atmosphere. The majority of greenhouse gases come from burning fossil fuels to produce energy, although deforestation, industrial processes, and some agricultural practices also emit gases into the atmosphere. Greenhouse gases act like a blanket around the Earth, trapping energy in the atmosphere and causing it to warm. This phenomenon is called the greenhouse effect and is natural and necessary to support life on Earth. However, the build-up of greenhouse gases can change Earth's climate and result in dangerous effects to human health and welfare of ecosystems.

Climate report (Intergovernmental Panel on Climate Change (IPCC),2013) show that Earth's average temperature has risen by 1.4°F (0.8 °C) over the past century, and is projected to rise another 2°F to 11.5°F (1.133 to 6.42 °C) over the next century. This report also indicates consensus on the link between human activities and global warming. Small changes in the average temperature can translate to large and potentially dangerous shifts in climate and weather (Faure, M.G. & Peeters, M.
2008). Many places have seen changes in rainfall, resulting in more floods, droughts, or intense rain, as well as more frequent and severe heat waves (Corner, A et al. 2011). The planet's oceans and glaciers have also experienced some big changes - oceans are warming and becoming more acidic, ice caps are melting and sea levels are rising (Corner, A. et al. 2011; Faure, M.G. & Peeters, M. 2008). Warming climates will bring changes that can affect our natural environment, water supplies, agriculture, power and transportation systems, thus effecting human health and safety. As these and other changes become more pronounced in the coming decades, they will likely present challenges to our society and our environment.

Buildings are central to the EU's policy on energy efficiency as nearly 40% of final energy consumption and 36% of greenhouse gas emissions is from houses, offices, shops and other buildings. Thus, it is crucial to improve the energy performance of Europe's building stock, to achieve EU's 2020 targets but also meet the longer-term objectives of our climate strategy as laid down in the Low Carbon Economy Roadmap 2050 (Gänzle, S. Grimm, S. & Makhan, D. 2012).

Directive 2010/31/EU on the energy performance of buildings (EPBD) is the main legislative instrument at EU level for improving the energy efficiency of European buildings (European Portal for Energy Efficiency in Buildings, 2010). A key element of the EPBD, especially for achieving these longer-term objectives, is its requirements regarding NZEBs.

Article 9(1) of the EPBD requires Member States to "ensure that:

(a) by 31 December 2020, all new buildings are nearly zero-energy buildings; and
(b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings."

Under the EU Commission’s ‘Energy and Climate Package (2009)’, Ireland is
required to deliver a 20% reduction in greenhouse gas emissions by 2020 and keep emissions below annual limits over the period 2013-2020. The projections show a reduction in Ireland’s gap to targets for the Kyoto Protocol and the EU 2020 targets. This reflects a combination of the effects of the economic recession as well as assumptions on the full implementation of relevant government policies. In Ireland the new building regulation in force since 2015 increases the requirements of energy efficiencies of buildings. The new building owned /occupied by the public authorities after 31st December 2018 must be NZEBs and all new buildings are to be NZEBs by 31st December 2020, which will be to a large extent from renewable sources. Thus, we can see dominance of environmental policies in the name of sustainability at the policy level.

4.4.3 Life cycle approach (LCA):

SD’s main focus is on LCA which considers the implications for communities in which raw materials are produced and disposed of in a sustainable manner at the end of its life span. A key objective of the LCA is to help and support decision making towards more sustainable product and process systems, thereby promoting a change from unsustainable practices and patterns. Understanding, quantifying and communicating the sustainability of products is part of the solution to continuously reduce their impacts and increasing their benefits to society. Urban development projects could benefit from a more explicit use of life cycle thinking, at a strategic level, to aid in the scoping and screening of risks and potential negative social impacts. LCA aims to increase the awareness of decision makers so that they can make better informed choices for more sustainable products and practices. This implies guiding enterprises and people in their efforts to reduce their environmental & social footprint, while
providing benefits for society. Thus, it is in line with the sustainability principle of meeting the needs of today without jeopardising the needs of future.

### 4.4.4 Environmental Sustainability: Project level sustainable development perspective

The concept of environmental sustainability advocates a number of strategies such as recycling and reuse that can effectively be employed to curb some of the environmental effects of construction projects. As a result, the concept of environmental sustainability has been adopted by all nations as a political goal due to the nature of its importance. Generally, although different models have been brought forward to show the interrelatedness of the three pillars of sustainability, they are normally represented as overlapping circles. Thus, we would critically assess the concept of sustainability with particular focus to environmental sustainability criteria in this section.

Table 4.3 below shows the various criteria which form part of environmental sustainability inclusion in a PPP project environment. As previously mentioned, there are no specific tools for sustainability evaluation of educational building projects in a PPP environment. Hence, tools used to evaluate traditional projects were studied in relation to environmental sustainability criteria and shortfalls were noted and incorporated in the above table. Thus, it is important to see how these factors can be incorporated in a PPP environment and highlight the main challenges facing their inclusion.
Table 4.3: Environmental Sustainability Criteria (Adapted from UNECE, 2010)

<table>
<thead>
<tr>
<th>Output specification</th>
<th>Possible techniques</th>
<th>Performance criteria</th>
</tr>
</thead>
</table>
| General environmental sustainability      | Adherence to recognised environmental management systems such as EMAS or ISO 14002; Appropriate use of Environmental Impact Assessments; Feedback on environmental performance from end user, local people and / or NGOs; | Audit of procedure  
Cost of incorporating this into bid over entire lifetime.  
Limit impact on environment  
Limit impact on neighbourhood |
| Land use and ecology                      | Minimize Land consumption  
Re use of land were possible  
Ecology Value of Site  
Mitigate impact on site ecology  
Enhancing site ecology |                                                                                       |
| Life-cycle analysis                       | Global Warning Potential  
Ozone depletion Potential  
Photo Chemical Ozone creation potential  
Acidification Potential  
Eutrophication Potential  
LCA indicators other than Co2 emissions  
LCI indicators for land use |                                                                                       |
| Efficient use of energy and security of supply | Use renewable sources  
Use on non-renewable resources, Establishment of ESCo (Energy Service Company) to supply the project’s energy and provide ongoing advice on improving efficiency and flexible means of financing renewable energy sources for the project | Running costs  
Carbon footprint  
Proportion of energy from renewable sources |
| Adherence to recognised building quality standards that require incorporation of sustainability principles in building design: e.g. making use of natural heating and ventilation, natural light Innovative technologies Carbon offsetting by creation of new habitat |
|---|---|
| Minimise waste | Re-use of materials during construction and operation Production of non-hazardous waste | Amount of non-recyclable waste produced (during construction and operation) Proportion of waste materials reused, recycled, composted, energy from waste, sent to landfill |
| Conserve water resources | Minimise water consumption Treatment of waste water; Grey water recycling; Rainwater harvesting | Running costs Limit onsite water pollution Proportion of clean / brown water usage Minimise surface run off |
| Minimise Vulnerability to flood risk | Porous surfaces to allow infiltration Creation of reed beds and green areas to absorb and store water | Number / severity of flood incidents at site and downstream |
| Maximise use of materials from local and sustainable sources | Sustainable procurement procedure for sub-contractors; Goods and services sourced locally; Substitution of non-renewable resources for renewable, Sustainable resources | Audit of construction and operating materials Proportions of natural resources sourced from sustainable sources Rational use of materials Source material with low impact |
| Minimise pollution | Clean technologies that reduce emissions; Avoidance of toxic substances Treatment of emissions to water, air and soil; Minimise noise and light pollution; Maximise vegetation | Local air/water quality indicators User / resident satisfaction |
| Protect biodiversity | Preservation of existing habitat; Creation of new habitat; Incorporation into building design | Number of critical species Area / quality of habitat |
4.5 Economic Sustainability

In the past, projects were mainly undertaken based on economic viability. This was largely premised on initial short-term views, such as the requirements that projects were only to be awarded to the lowest bidders based on the initial costs, as opposed to the long-term costs or benefits of the project over its entire life cycle. However, the inclusion of the other two pillars of sustainability, namely environmental protection and social equity gained momentum during the period of industrial environmentalism between the 1960s and 1970s.

Economic sustainability and development are aimed at controlling the environmental degradation. This is because environmental degradation has been witnessed to be worse in places of low income, poor social cohesion and where poverty levels are high. It has therefore been assumed that improvement to social capital in the low-income areas will conserve the environment. This argument has faced criticism from different schools of thought. Banerjee, S.B. (2012) argued that this definition makes economic development appear as only benefitting third and fourth world citizens. Economic development continues to be enriched by political and colonial thoughts. Policies and practices however remain very fundamental as components of economic sustainability.

4.5.1 Economic Sustainability: Project level sustainable development perspective

Economic sustainability is generally defined as the optimal use of resources in a responsible and beneficial manner, in order to guarantee an indefinite long-term economic production at a certain level, without compromising the needs of future generations (Gibbs, D. 2010). According to Daly, H.E. (1992), William Ibbs & Ying-Yi Chih, (2011) the economic dimension of sustainability is concerned with the
ability of a given project to indefinitely support economic production through efficient allocation and equitable distribution of resources. This is particularly important as it ensures that the project utilises resources in a responsible and efficient way that guarantees long-term benefits.

Table 4.4 shows the various criteria which form part of economic sustainability inclusion in a PPP project environment. As previously stated, there are no specific tools for sustainability evaluation of educational buildings projects in a PPP environment. Hence, tools that are used to evaluate traditional projects were studied in relation to economic sustainability criteria and shortfalls were noted and incorporated in the above table. Thus, it is important to see how these factors can be incorporated in a PPP environment and highlight the main challenges facing their inclusion.
### Table 4.4: Economic sustainability criteria (Adapted from UNECE, 2010)

<table>
<thead>
<tr>
<th>Output specification</th>
<th>Possible techniques</th>
<th>Performance criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximise local benefits</td>
<td>Use local businesses &amp; local labour; provide training in construction, operation, and maintenance. Local procurement</td>
<td>Percentage of procurement /employment sourced within a specific area Employment statistics (broken down into youth, old age, female, disabled, ethnic groups etc. Income statistics and distribution (again possibly broken down as above) National / regional / local GDP PPP completed and operated to budget and time Income generated by using out of hours facility for community use Private sector profits against expected profits Number of new businesses starting up over PPP lifespan</td>
</tr>
<tr>
<td>Worker/user health and safety</td>
<td>Compliance with relevant labour legislation Health and safety standards /regulations implemented</td>
<td>Worker and user satisfaction Number of accidents reported and monitored Worker and user attendance monitored Training provided to workers to create skilled workforce, thriving 3rd sector. Training provided to staff to report &amp; monitor building performance.</td>
</tr>
<tr>
<td>Improve building service life</td>
<td>Compliance with best practice and regulations</td>
<td>Improve building user productivity Improve building adaptability Commercial viability for change of use.</td>
</tr>
</tbody>
</table>
4.6 Sustainability and PPP Development:

The conduct of PPP ventures, including the implementation of sustainability is subject to increasing European regulation and control. This requires government and business to work closely together in partnership and base their decision-making on clear and consistent partnership structures as well as shared objectives regarding the delivery of particular projects. The primary rationale for the inclusion of sustainability in the PPP school projects is to improve educational outcomes, while at the same time conserving resources for future needs (Raudsepp-Hearne, C. Peterson, G.D. & Bennett, E.M. 2010).

The recent economic crisis and dwindling national budgets coupled with increasing public expectations have obliged many member governments, like the UK government, to seek more innovative ways of incorporating sustainability in their PPP projects or investments in order to meet their public objectives (Zhou, L. & Smith, A. 2012). This has culminated in arrangements that bind secondary agents in PPP arrangements including high percentages in waste and noise reduction and dust levels, technological innovations like green roofs, natural ventilation and a focus on occupant comfort (Zhou, L & Smith, A. 2012). The EU has no specific law for the implementation of sustainability in particular to PPP projects. It is found in the various policy documents like the EU Sustainable Development Strategy issued by the Commission in 2009, EU treaties and various guidance notes concerning the design and principles of a construction project.

In the Republic of Ireland, educational school projects have been carried out under Design, Build, Finance, Operate and Maintain (DBFOM) contracts. Under this arrangement, a number of responsibilities related to sustainability such as designing, building, operating and financing of the educational school projects are bundled
together and transferred to the private sector partners (PPP, 2014). Generally, PPP projects help in delivering any priority economic infrastructure project in the context of National Development Plan (NDP) and in terms of provision of high-quality services (Cuttaree, V. & Mandri-Perrott, X.C. 2011). Despite these good intentions, the success level of the PPP construction industry in terms of implementing the principles of sustainable design development, is dictated by different factors like regulations, infrastructure support and political goodwill among others. As it pertains to the educational PPP projects, the PPP construction industry constantly devotes efforts towards attaining given thresholds like infrastructural capacity, skills base and knowledge that fit projects that are undertaken in the school arena (Ball, R. & Heafey, M, 2000). Attainment of the aforementioned thresholds is believed to lead to successful implementation of sustainable educational PPP projects.

Although a considerable number of Irish schools are now incorporating limited sustainability measures in their construction projects, there are constraints that stand in the way of these projects. Currently, many PPP school projects still face a number of challenges and difficulties, such as high initial costs in inclusion of sustainability without the appropriate legal framework (McCann, S.; Aranda-Mena, G.; Edwards, P.J. 2013). Some major challenges facing the inclusion of sustainability in PPP school projects include fiscal constraints, insufficient legal frameworks related to the implementation of sustainability in PPP projects, ineffective coordination between the public partners and lack of sufficient awareness of the need for sustainability in the PPP school projects (Atmo, G. & Duffield, C. 2014). This chapter critically analyses some of the contemporary challenges currently facing the inclusion of sustainability in the PPP projects, with particular focus to Irish PPP schools.
4.7 Legal Framework for Implementing Sustainable Design Principles on PPP Educational building projects

4.7.1 The Road from Rio

Sustainable development emerged as a compelling concept that had to be integrated into construction and production in the late 1980s. This culminated in the Earth Summit in Rio de Janeiro, 1992. At the Summit, world leaders agreed to implement an action programme for sustainable development called Agenda 21. Since 1992, much work has been carried out at national and international levels to implement Agenda 21 and achieve more sustainable development. This culminated in a detailed outline, presented in Agenda 21 to fit things into the Irish context (Department of Environment, 1997).

4.7.2 EC influencing Europe

Although public-private partnerships are currently not subject to special sustainability related rules in the EU, PPP projects are regulated by various principles and rules of European treaties including those embodied in the secondary legislation. However, EC has always recognised the potential of PPP projects, it was not until 2003 that it became an important agenda in the European Union and attention began to focus on their regulation (Adams, W.M. 2001).

The current legal and regulatory framework supporting the public-private framework in the EU is particularly designed to facilitate the investment projects and long-term public-private partnership arrangements, ensure appropriate regulatory controls, reduce transaction costs as well as provide the legal mechanism for PPP projects.

In 2000, the EC developed and published an interpretative communication, under its
Community Law. This sought to provide guidelines and enhance the legal certainty of the application of the community laws to regulate the institutionalised PPP by member states (EC, 2004). The inclusion of sustainability in development projects is increasingly becoming one of the major concerns among the EU member states (Gänzle, S. Grimm, S. & Makhan, D. 2012). However, there is a clear indication that the EU is dedicated and committed to promoting the inclusion of sustainability on PPP projects as part of its growth initiatives.

The EU treaty of Lisbon set a number of targets to ensure that the EU becomes one of the most dynamic and competitive economies of the world, with a sustainable growth and greater social cohesion by 2010 (Craig, P. & de Búrca, G. 2014). On the other hand, the Stockholm European Council agreed that the EU SD strategy should be built on political commitment that includes the environmental dimension. This strategy particularly maintains that long term economic growth must go hand in hand with social cohesion and environmental protection (EC, 2001). Despite the fact that article 2 of the EU Treaty (SD) does not make any reference to the PPPs, it draws attention to the issue of sustainability in the public procurement sector and suggests that the legislative framework of the public procurement should take into account the various environmental concerns aside from its economic goals (EC, 2001; EC, 2004). The article also directs that all EU member states must consider making better use of their public procurements to favour sustainable products and services.

Article 158 of the EU Treaty addresses the linkage between PPPs with Sustainable Development, based on the belief that PPPs are critically essential in the tackling of market failures in various urban areas within the EU. In 2004, the EU published a special “Green Paper” on the PPPs and Community Law of the public concessions and contract, taking note of the existing practices from the European law

In cases where a project requires generation of revenue for procuring public sector entity, EC policy requires it to be designed to promote sustainability. The EU aims at promoting innovation and research in order to ensure the attainment of sustainable PPP projects that are more profitable and useful to the environment. This arrangement is meant to engage the private industry by the utilisation of a cutting-edge technology and management methods that reduce costs over the entire life-time of the project. This implies that design & construction risks are lower and the potential operating profits are higher, making them more attractive to private investors.

Sustainability generally benefits from technology and innovations. PPPs benefit significantly from these new methods and approaches to building and construction. During specific projects, the use of technology and innovation enhanced the gains of private and public stakeholders in the projects. The private sector gained higher returns on investment and efficient methods of undertaking projects. On the other hand, the government benefitted from specific sustainable PPP enhancements and local consumption, and utilisation of the facility is optimal. Furthermore, private partners get a more effective mechanism and system of working with their public sector partners and this ultimately attracts more investment opportunities into regions where a PPP is executed. Finally, the users of the facility constructed get a more sustainable building.

In spite of the structured nature of EU law on construction, there are some limits on their regulations relating to the socio-economic aspects of PPP procurements. There seem to be a major focus on the environment to the neglect of social and economic sustainable variables. This is particularly due to the difficulty in including social
aspects in the procurement activities of most PPP projects. In this regard, there is an urgent need to develop a more holistic and integrated legal framework for the EU in order to ensure that the PPP projects are more sustainable. This will particularly help solve the general ambiguities currently surrounding the implementation of sustainability in PPP projects among many EU member states.

The legal framework for implementation of PPP contracts in Europe observes Law 3389/2005 titled “Partnership between public and private sectors”. The major issues under this law include the definition of PPP concepts alongside the scope of the project and conditions for subsuming PPP projects within the specific requirements of the law, determination of the procedures to award PPP projects, definition of contracting framework plus financing issues and regulation of legal issues and partnership concerns that surface during project processes (Robinson, H. 2010). Thus, it does not include any specific framework in relation to sustainability.

Hence, it is worth noting that under the EU law on PPP there is no particular system that governs all issues relating to PPPs. There is EU legislation that fits given perspectives of PPPs. For instance, PPPs do represent a single approach to public sector procurement. In this regard, the EU features two directives centred on the procurement processes: The Utilities Directive (2004/17/EC) that details the procurement procedures that pertain to entities operating in postal, transport, energy and water sectors and the Public Sector Directive (2004/18/EC) that details the legal procedures for award of work-related, public service and public supply contracts (Hemming, R. 2006). Further, all PPP contracts have to be examined as per the principles and rules defined by the EC treaty including the principles of mutual recognition, proportionality, equal treatment and transparency. These directives are principally aimed at ensuring the economic streamlining for the economic operators
to fully enjoy the fundamental freedoms; in the completion of major PPPs as per the public procurement contracts. Generally, most countries within the EU also have their own legal frameworks regulating sustainability of the PPP projects.

In Ireland, the main laws that guide PPP projects include the National Treasury Management Agency Act, 2014. There are older laws including the NDFA (Amendment) Act, 2007 and the NDFA Act, 2002 as well as the State Authorities (PPP Arrangements) Act, 2002. These laws define the codes of best practice for the delivery of PPP projects within the construction industry that involves private and public partners (PPP Ireland, 2015).

There have been some rules and policy regulations relating to PPP accounting and systems. This includes some changes and modifications that affect elements and aspects of PPP accounting which relate to the core variables being studied in this research. They are illustrated in Table 4.5 below. This has a relationship with the development of these rules as defined in Table 4.6.
## Table 4.5: Summary of EU legal framework for PPP.

<table>
<thead>
<tr>
<th>Date</th>
<th>EU Initiatives and Directives related to PPP</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Directive 2014/24/EU on public procurement</td>
<td>EC Public procurement</td>
</tr>
<tr>
<td>2014</td>
<td>Directive 2014/23/EU on the award of concession contracts</td>
<td>EC Public procurement</td>
</tr>
<tr>
<td>2008</td>
<td>Rules applicable to Institutionalised Public-Private Partnerships (IPPP) 2008/C 91/02</td>
<td>EU law and publications</td>
</tr>
<tr>
<td>2004</td>
<td>New Procurement Directives - Including Introduction of Competitive Dialogue</td>
<td>OJEC</td>
</tr>
<tr>
<td>2004</td>
<td>Eurostat proposals on accounting treatment of PPPs.</td>
<td>CMFB/Eurostat news release (STAT/04/18) Feb 2004</td>
</tr>
<tr>
<td>2003</td>
<td>Guidelines for successful Public-Private Partnerships-DG region and dissemination at a series of International conferences.</td>
<td>DG Regional Policy</td>
</tr>
<tr>
<td>2003</td>
<td>The European Initiative for Growth – Investing in Networks and Knowledge for Growth and Jobs</td>
<td>COM (2003)690 final</td>
</tr>
<tr>
<td>2002</td>
<td>Building a Valuable Approach to PPPs: Procurement Working session on the draft guidelines</td>
<td>COM (2001)0370</td>
</tr>
<tr>
<td>2000</td>
<td>Commission’s Interpretative Communication on Concessions under Community Law</td>
<td>OJEC (2000/C 121/02)</td>
</tr>
<tr>
<td>1997</td>
<td>High Level Group on PPP financing of TEN-T projects (Kinnock Report)</td>
<td>COM (97)453</td>
</tr>
<tr>
<td>1993</td>
<td>White paper on Growth, Competitiveness and Employment.</td>
<td>COM (93)700</td>
</tr>
</tbody>
</table>
Table 4.6: Summary of table of the EU initiatives & directives in place regarding Sustainability

<table>
<thead>
<tr>
<th>Date</th>
<th>Directive, Legislation or Law regarding Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Europe 2020 Flagship Initiative: Resource-Efficient Europe Fair Trade’s contribution to Sustainable Development</td>
</tr>
<tr>
<td>2010</td>
<td>Europe 2020 Flagship Initiative: An Integrated Industrial Policy</td>
</tr>
<tr>
<td>2010</td>
<td>Europe 2020 Flagship Initiative: Innovative Europe</td>
</tr>
<tr>
<td>2007</td>
<td>EU treaty of Lisbon that set targets to ensure that the EU achieved sustainable growth and greater social cohesion by 2010.</td>
</tr>
<tr>
<td>2004</td>
<td>Publication of a special “Green Paper” on the PPPs and Community law of the public concessions</td>
</tr>
<tr>
<td>2001</td>
<td>European Union Sustainable Development Strategy (EU SDS)</td>
</tr>
</tbody>
</table>

4.7.3 Irish Context:

In Ireland, SB1 & SB2 were procured using the third version of the Standardisation of PFI Contracts (SoPC3) to regulate its PPP projects and other various PFIs. SoPC3 particularly sets out and standardises the roles of both the government and private partners in order to reduce the procurement time and costs, as well as deliver greater value for taxpayers’ money (PPP, 2014). However, Ireland is one of the few common law jurisdictions where all legal matters including the issues of PPP projects and sustainability are mainly governed and regulated by case laws and precedents, as opposed to a particular civil code. Unlike the EU civil law member states, where the administrative laws provide the fundamental principles governing PPP contracts, Ireland has a distinct approach to many of the issues relevant to the sustainability of the PPPs thereby providing a framework in which the sustainability of the PPP school projects may be negotiated at the national level (Department of Environment, Heritage and Local Government, (DoEHLG) 2003). Finally, under the terms of EU 2020 targets, the Irish government is currently committed to making the
developments in Ireland including the PPP projects to be sustainable (Government of Ireland, 2008).

Although Ireland has a well-developed legal framework, it is still faced with several loopholes. Many experts have recently proposed a number of recommendations to improve the institutional and regulatory framework regarding the inclusion of sustainability in PPP projects. For example, it is widely believed that developing effective and clear regulations and proper legal framework, that stipulates the roles of both the public and private partners in ensuring that the inclusion of sustainability will create a win-win scenario for the projects and ultimately benefit the end user. The evolution of these legal rules is presented in Table 4.7 below which shows the timeline of how things changed, and the processes followed.

**Table 4.7: Summary of legal framework in place regarding sustainability in Ireland**

<table>
<thead>
<tr>
<th>Date</th>
<th>Directive, Legislation or Law regarding sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>Sustainable Development - a Strategy for Ireland</td>
</tr>
<tr>
<td>2001</td>
<td>National Spatial Strategy 2002-2020</td>
</tr>
<tr>
<td>2002</td>
<td>Making Ireland’s Development Sustainable: Review, Assessment and Future Action</td>
</tr>
<tr>
<td>2006</td>
<td>The social partnership agreement ‘Towards 2016’</td>
</tr>
<tr>
<td>2008</td>
<td>Sustainable Travel and Transport Action Plan</td>
</tr>
<tr>
<td>2013</td>
<td>Our Sustainable Future- A framework for Sustainable Development in Ireland</td>
</tr>
</tbody>
</table>
4.8 The role of Public Partners (Public Sector)

In the Republic of Ireland, the public partners are the main driver in facilitating the PPPs from the detailed appraisal stage, statutory stage, pre-procurement stage to construction stage. This may particularly place the public partners in a better position to facilitate the inclusion of sustainability; however, the specific roles of the public partners may vary from one project to another. The main role of public sector in most PPP school projects in Ireland include issuance of purchasing supplies, contracting workforces and lastly, providing public procurement services. After the project is identified as a PPP project and a decision has been made to proceed by the DPER for the DoES to compile a detail appraisal of the project. The DoES is responsible for the pre-procurement of the PPP project while the NDFA is responsible for the procurement stages of the PPP. After the construction is completed the project is transferred back to DoES for administering the contract during its operation stages.

Stage 1 - Detailed Appraisal Stage

During the Detailed Appraisal Stage, the public partner is charged with a number of responsibilities some of which include preparation of the PPP assessment, carrying out initial assessment of the project & compiling the project procurement checklist. This mainly includes site suitability assessment, project briefing and site reporting along with an outline scheme for the proposed project. These works are normally outsourced by the DoES Planning and Building Unit (PBU) to consultants. Thus, it is very important at this stage that the PBU selects the consultants with the appropriate knowledge on sustainability, along with its prerequisite requirements for consultancy work. The detail appraisal will include assessment of site suitability for
the project, drawing up of briefing documents & site reports, thus identifying areas of consideration from the point of social and environmental sustainability along with an outline scheme. Hence it would be paramount to set the requirements at the very start of the project to give clear direction and flow to the next stages of PPP process. In addition, the public partner is responsible for developing a general policy framework including the legal framework that will enable the PPP to operate efficiently and effectively. The main mechanism of achieving this deliverable is by providing guidance to both the state agency (public partner) and the private partners involved in the project. Some of the other key functions of the public partners may include procuring, giving financial advice and project managing the PPP project. Additionally, the Accountable Officer in charge of this PPP project on the public sector must have a clear understanding of risk allocation and project finance issues, that are likely to emerge as the project develops. When introducing private finance to the provision of a public facility the process brings with it a range of new financial issues of which the Accountable Officer must be aware. In Ireland, NDFA provides assistance on this issue to the Accountable officer (DoES). The finance for a PPP project will be raised by the private sector using a combination of equity, internally generated cash flow and debt. Thus, adequate provision for sustainability measures should be included while preparing the PSB. This will give clear direction to the project moving forward in relation to sustainability.

Stage 2 - Statutory Stage

At this stage, the public partner assumes various oversight roles such as, briefing consultants and analysing the project’s risk assessment report. The role of the public sector at this stage is to provide policy guidance, in the form of documents which
will help in the smooth running of the project. This may also include among other things, defining the relevant sustainability measures, as well as the legal framework under which they are to be carried out, in order to enhance the inclusion of sustainability. Another important role of the public partner, that may influence the inclusion of sustainability, is its gatekeeper role throughout all the stages of the project. For example, as the sponsor of the project, it has the primary responsibility of approving or suggesting changes in all the phases of the project, as well as providing the various technical supports required in the procurement, evaluation and contract management phases. In PPP projects, such as the educational school project, which will provide for the intellectual development of the future citizens and is ultimately good for the public, the public partners may also provide subsidies such as in the form of one-time grants, tax breaks etc. in order to make the project more attractive to the private sector.

**Stage 3 - Pre-procurement Stage**

When the project has moved to the pre-procurement stage, the public partner normally acts as the sponsoring agency on behalf of the Government in procuring the required service. In the case of educational projects, the public partner may be responsible for determining the viability of a given contract and the criteria of contract price, to avoid a scenario of the lowest bid on the basis of inferior design. The public partners also act as the regulator of the land use in relation to sustainability. It can therefore provide either negative or positive influence on the sustainability of any PPP school project. For a successful project, the public and private sector partners must predominantly keep in touch with the contacting authority and abide by its rules. The traditional directive is the diversely influential
policy in the sustainability of PPP school projects. This directive applies to public works, private premises and public service contracts which have a value, excluding VAT, estimated to be not less than the pre-established thresholds. For a PPP school project to be sustainable it should follow the contracting authority thresholds; these thresholds are consequently recalculated by the public sector commission after every two years (Bloomfield, P. 2006).

**Stage 4 - Procurement Stage**

At this stage, the main roles of the public partners include issuance of Official Journal of the European Union (OJEU) notice, establishing audit criteria, organising public meetings, shortlisting bidders and measuring the actions against the audit criteria. In addition, in terms of ensuring accountability during the completion of the project, the public partners have an overall responsibility to carry out the initial assessment and have knowledge of various matters including the sustainability of the project. For example, in the case of school PPPs, the authority has to know the needs of the school users: available in the form of the initial submission from the school management authority. The procurement officer should be aware of the current market for schools’ PPPs: this information changes with time and will be generated by the PPP assessment. Also, the procurement officer should know the outcome of earlier schools’ PPPs: currently, information is available for the Grouped Schools Pilot Partnership Project (Robinson, 2010). The other PPP projects’ outcomes must also be documented as further Irish PPP schools are procured.

Sanctioning the PPP project is another important role of the public partner that may be critical in the successful inclusion of sustainability in the project. Basically, the
public service has the responsibility of sanctioning the expenditure of the procurement process. In the case of PPP in Ireland, this is part of the role of the DPER. They also approve the Affordability Cap, the baseline at which the cost of the project cannot rise. The principal outcome of the PSB will be the establishment of the maximum cost (the Affordability Cap) that must not be exceeded, if the project is to be procured as a PPP. Once the Affordability Cap is established, it must be sent along with the PSB to the Sanctioning Authority for approval to proceed to the Procurement Stage.

Stage 5 - Construction Stage

In the PPP construction stage, the public partner through the contract manager, has various responsibilities, to include:

- Developing a Monitoring Plan to follow the monitoring procedures set out in the Project Agreement.
- Maintain record availability of the accommodation available for school usage.
- Particularly, record any action that might adversely affect the operation of the school; such as, maintenance work, monitoring performance standards to the standard of the facilities available and the usage of such facilities related to those defined in the Project Agreement.
- Payment authorisation through procedures to be set out, agreed and implemented among others (Cuttatree, V. & Mandri-Perrott, X.C. 2011).

Finally, with these important roles and responsibilities regarding PPP projects, the public partner has significant influence on the success of the inclusion of
sustainability in the project through accountability, transparency, efficiency as well as effectiveness.

**Stage 6 - Operation Stage**

This stage of the project sees the final constructed school building put to use by the stakeholders. However, the maintenance and availability of the premises are still the responsibility of the private partners. Thus, at this stage it’s the responsibility of the private partners to provide the school campus to the school authorities, as per the requirements stated in the contract documents. Unavailability of any premises will have a deduction in the unitary payment as per the contract document.

**Stage 7 - Hand back Stage (at the end of the concession period)**

At the end of the concession period, the project is handed back to the public partner, in accordance with the requirements agreed in the contract documents. Thus, it is important for the public partners to include an acceptable degree of continuity in relation to sustainability. Failure to attain this will render the project partial and incomplete in relation to sustainability inclusion.

**4.8.1 Summary of the role of Public Partner**

In summary, the public partner plays a critical role in PPP projects from the detailed appraisal stage to the statutory pre-procurement stage through to construction stage. This places the public sector in a position to oversee all the stages and facilitate the inclusion of sustainability in the project. However, it is worth noting that the specific roles of the public partner may normally vary from one project to another. With regard to sustainability, the public partner plays a crucial role influencing
sustainability on PPP projects in Ireland in the following way; typically, in a PPP project, the public partner can consist of a number of parts of the public sector each having specific responsibilities in relation to the project. Thus, based on their role of sponsoring and ensuring accountability, it is the public partner along with its technical advisors who develop the framework for implementing sustainability on PPP projects.

4.9 The Role of the Private Partner:

Similarly, the private partner plays a number of critical roles in all the stages of a PPP project. Some of these roles that may significantly influence the sustainability of the project, include project financing, technical support as well as undertaking the operational risks and sustainability assessment of the project. In most cases, private sector partners are either individuals or groups who are influenced by the State, but ultimately work as profitable enterprises (Hemming, R. 2006).

Stages 1&2 - Early Project Stages

During the early project stages, the private partner plays a number of critical roles, some of which may include identifying the criteria for their involvement in the PPP project, deciding on their preferred role, participating in public meetings regarding the potential of the project and submitting their expression of interest as a consortium that bids for the project. The Irish PPP school building projects typically adopt the design-built-finance-operate (DBFO) strategy for its educational projects.

Stage 3 &4 - Procurement Stage

At this stage, the key roles of the private partner include formally signing the
agreement for the project, preparing and submitting the bid. Under this scheme, the government supplies details of the services required of the private partner. It is then the private partner’s responsibility and duty to design and build assets that specifically meet the government-stated purpose, finance the construction process and finally operate the asset. This process reflects a widespread belief that the private sector will deliver services with greater efficiency. Specifically, using this process will improve the quality of the constructed assets and lower the costs associated with the service provision (Hemming, R. 2006). These are key factors for the attainment of sustainability in a construction project.

Stage 5 - Construction Stage

The construction stage of a PPP project involves the private partner constructing the facility and providing the key services defined in the tender documents. This is particularly important in relation to sustainable development, as the specific tender documents’ requirements relating to sustainability have to be fully adhered to. According to Hearne, R. (2009), the private partners offer a number of ancillary economic services in sectors such as schools and hospitals, and the services are in most cases economically viable. This serves as a proof that whenever the private sector provides service to the public sector, its efficiency is based on the requirements of the public sector and is economically beneficial solution for the private partners.

Stage 6 - Operation Stage

At this stage the project is occupied by the school authorities with built-in availability criteria as per the contract documents. Thus, it is in the interest of the
private partners to ensure the usage of the project is executed in ways that ensure sustainability in relation to the environment and society as a whole. This requires some degree of management and in some cases, progressively reducing the environmental footprints of the project. This will help to ensure that the project meets its objectives and can be used into the foreseeable future without any major issues to the environment, society or the economic circumstances of the stakeholders.

**Stage 7 - Hand back Stage (at the end of the concession period)**

At the end of the concession period, there is hand back of the project to the public partner, in accordance with the requirements agreed in the contract documents prepared at the tender stage. Thus, it is important for the public partners to include acceptable degrees of continuity in relation to sustainability. Failure to attain this will render the project partial and incomplete in relation to sustainability inclusion.

**4.9.1 Summary of the Roles of the Private Partner**

In summary, there are a number of ways through which the private partner can influence sustainability on PPP projects. For example, during the early stages of the project, the private partner’s role is often to identify its core team comprising; a construction specialist (one or numerous Contractors), an operating specialist to manage the operation of the facility (Operator) and one or more financial specialists that would concentrate on securing the funding necessary to the project (Financial Partners). Additionally, at this stage, the private partner can also ensure that appropriate technologies are used to ensure the sustainability of the project.
4.10 Summary of challenges facing the Public Partners:

The implementation of sustainability in the PPP school projects in Ireland has always presented a diverse number of challenges to the public partner. Despite the fact that a considerable number of educational projects are now incorporating sustainability in their PPP projects, many PPP school projects are currently still facing a considerable number of challenges and difficulties, including high initial costs in their inclusion of sustainability (Ball, R. and Heafey, M. 2000; IISD, 2012). As the Irish government continues to rely on PPPs to undertake public ventures such as school projects, there is an urgent need to address and mitigate the potential hindrances to the successful implementation of sustainability in the PPP school projects (DoEHLG, 2003).

Some of the major contemporary challenges facing the inclusion of sustainability in PPP school projects are high economic costs and fiscal constraints, lack of proper regulatory and legal frameworks in relation to implementing sustainability, ineffective coordination between the public partners, and insufficient awareness of sustainability, among others.

4.10.1 Fiscal Constraints

Fiscal constraints are one of the major challenges that are currently impacting on the inclusion of sustainability in the PPP school projects across the country. Higher initial cost requirements for the inclusion of sustainability on PPP projects, have led to larger debt incurrence by these projects (Scerri, A & James, P. 2010). For example, the UK Conservative Government introduced the PFI, which was ultimately declined (King, P. 2015). The PFI was the first systematic programme aimed at providing monetary allocation to PPP. Due to high costs currently incurred
materialistically in the uplifting of PPP, the EU has resorted to focus on the reduction of Public Sector Borrowing requirements, thus largely making the fiscally, illusory public accounts.

According to Eurostat, the national debt and deficit treatment of the PPP projects is one of the critical issues affecting the public partners in most membership countries. As the main statistical EC Office, the Eurostat currently specifies the deficit/surplus and debt of regarding the PPP projects in all the government units of the member states, as set out in the 2004 and 2010 guidelines.

Arrangements that pertain to PPP projects are quite complex and need the attention of a number of experts from disciplines such as finance, law and transaction advisory. Generally, these projects need comprehensive inputs from the experts and the procedure for delivery of such inputs is, in most cases, underlain by expensive procurement and tendering processes. In addition, the public partner is compelled to give sufficient sensitisation to ensure that the target consumers (general public) buy-in the projects under construction as a measure to evade the possibility of the public’s rejection of PPP projects at the implementation phase. Though beneficial, this measure can end up introducing cost overheads.

Since the global recession, a reduction in public revenue and increment in national indebtedness has been overly experienced. The national debt has ultimately become a significant influence on the economic treatment of a PPP. Until lately, the recovery and rebuilding of various premises infrastructural projects were prioritised rather than those in the educational sector. Ireland has managed a balance and have educational sector projects implemented along with the transportation and other commercial sectors. Due to the recession some of the educational PPP projects were shelved, for example the third level bundle 1 & 2 projects, but the schools programme
has been active and has overcome the financial hurdles of providing the PPP SB2. Thus, it is noted that even after the rise in public debts, Ireland has managed to keep some of the schools PPP programme active.

The PPP finances are exercised wholly by the respective state government. This minimises the amount of funds collectively available for the PPP projects. Without political will, very little support is given to the sustainable development issues on a project PPP. Therefore, sustainability is not adequately considered in the PPP projects (Dresner, S. 2002; IISD, 2012). The profit margin allowance, by the contracting authorities to the stakeholders of these projects, is minimal. This demoralises those who are willing to financially uplift these projects in the long-run.

Lastly, the Global economic recessions are fundamentally to blame for the experience of challenges faced on inclusion of sustainability on PPP projects. The recent world recession has undermined sustainability implementation on PPP projects. Demographic changes are permanent and the ageing populace is prone to increasing pressure on a government’s expenditure. This pressure will ideally mean that PPPs will have to conservatively make tactful choices and trade-offs to manage the long-term social, economic and environmental procurement challenges.

### 4.10.2 Poor Coordination between the Public and Private Partners.

The ineffective coordination between the public and private partners is one of the critical challenges currently facing the inclusion of sustainability in the PPP school projects in Ireland. This is normally attributed to miscommunication of the project goals, that include sustainable development, poor accountability, and autonomy within partnerships regarding risk.

Generally, the complexity of the PPPs in terms of the nature of contract negotiations,
complex organisational structures, lengthy contracts and little participation of the public stakeholders, normally impact on the governance and coordination of such projects thereby presenting a challenge to the inclusion of sustainability. Dresner, S. (2002) and IBEC (2012) states, at the time of economic uncertainty, the contacting authorities and the PPP private partners are competing regarding inclusion of which sustainability measure fits the project and society at large. Lack of understanding between these two parties has led to the decline in inclusion of sustainability measures on PPP projects.

Misunderstandings or conflicts are likely whenever there is poor engagement between the two partners. The private partners greatly rely on the input provided by the public partners. In most cases, the private partners will tend to focus on the brief or output specification provided by the public partner to implement the requirements of the project. Very little is done to improve the quality of services, unless there are remarkable benefits relating to the private partnerships providing the barest minimum requirement, as spelled out in the output specification. Also, absence of collaboration could lead the private partner to take the inputs of the public partner as the only criteria whenever they design sustainability plans. This can result in the final design plans giving contrasting perspectives of the economic infrastructure that is crucial in the process of sustainable development.

The implementation of various PPP projects policies is overly constrained by public partners’ understanding of community ownership technicalities. Insufficient technical and administrative skills of the contracting authorities have also been viewed as challenges associated with the decline of public-partnership projects.
4.10.3 Poor Regulatory and Legal Frameworks

Globally, the issue of sustainability is controversial. The issue of climate change and global warming are strongly contested. Whilst some parties believe climate change and global warming is nothing but a hoax, others present empirical evidence to support its occurrence. Currently, a lot of evidence have been presented by scientists to support global warming and climate change, and the need to address it. A recent study indicated that scientists are 95% certain that climate change has a scientific basis and as such, the doubt and conflict relating to this and many other aspects of sustainability is almost settled (Chow, D. 2013). Thus, there is grounding for PPP projects to include elements of climate change and global warming in its plans. However, this is subject to regulations of the relevant authorities.

Despite all the progress made in the expansion of EU legal jurisdiction, a proper legal framework to regulate on individual benefits on these utilities still lacks. A number of EU governments try implementing the PPPs without defining a general sector regulatory regime (UN, 2008). Equally, other countries are fond of the practice of adopting sector regulatory regimes that are not in harmony with the PPP agreement. The risks associated with use of PPP contract rules that contrast the rule employed under sector regulation are certain. In another sphere, some of the EU regions have featured sector regulatory requirements that impact the PPPs and that do not encompass services directly rendered to final consumers. Thus, the public partners often have a challenge in checking whether the proposed PPP projects can obtain investment and licensing approvals under an existing regime.

Critics of the current EU legal and regulatory framework state that inclusion of sustainability in PPP projects lack clear structured approach in facilitating proper decision making, which has resulted in poor implementation of sustainability in the
design of PPP projects within the EU. For example, one of the common arguments has been the lack of proper legal framework and government body with a deeper knowledge in implementing sustainability measures on PPP projects. This has led to a loss of direction in identifying weaknesses and loopholes that were evidently observable during the initial stages. Thus, for a PPP project to have sustainable development incorporated successfully, it would require a strongly adopted PPP policy that could facilitate a smooth-running PPP structure, an attractive environment for private parties and well-structured legal policies that facilitate working with the private party in full complement.

In Ireland, there have been increasing concerns regarding risk transfer which are documented in Hearne’s (2009) analysis. Hearne, R. recommended that contacting authorities in Ireland revert to the alternatives to PPP projects approach (DoEHLG, 2003). The risk transfer of PPP projects is estimated on the basis of the challenges experienced towards the construction of PPP educational projects (Hearne, R. 2009). The Irish PPP projects include a vital role of contract monitoring by the public sectors; this is done specifically in areas where the performance risks are transferred to the private stakeholders.

Generally, the EU legal framework regarding the sustainability of PPP projects has placed significantly little attention to the social-economic aspects of PPP procurements. This is particularly due to the difficulty in including social aspects in the procurement activities of most PPP projects. In this regard, there is an urgent need to develop a more holistic and integrated legal framework for the EU, in order to ensure that PPP projects are more sustainable on the grounds of social-economic and environmental. This will particularly help solve the general ambiguities currently surrounding the implementation of sustainability in PPP projects among
many EU member states.

According to many experts, the legal framework that governs European PPP projects should be developed and structured to focus on issues like defining the scope of projects, outlining the steps to be followed when awarding PPP projects and of handling financial issues that surface while the PPP projects are ongoing. An example of the issues that are common in the legal framework used within the UK is PFI. PFI is an approach to procurement that public partners use to allow private partners to finance, build then operate infrastructure, whilst providing longstanding management services to the constructed facilities.

4.10.4 Lack of Awareness of the Need for Sustainability

Lack of awareness of the need for sustainability may also affect the development of PPP projects. The parties in PPPs that are not familiar with the sustainability measures of a project and its benefits in the long run would definitely decline on their needed support. Due to the absence of awareness of the importance of sustainability among many facility providers, it has been difficult for public partners to consider paying for the extra costs, in order to ensure that their PPP projects are in line with the long-term sustainability requirements (Bloomfield, P. 2006).

Additionally, although advisors such as sustainability specialists are often important in ensuring the successful implementation of the PPP projects, they are normally expensive and many projects across Ireland have not continued the services of sustainability specialists past their project evaluation phases. For projects to be successful there is a need for civic education for the general public, who happen to be stakeholders in various PPP projects (Connolly, C & Wall, T. 2011). As long as any PPP project stakeholder lacks knowledge on a sustainability need, the
performance objectives pertaining to PPP projects, endeavours risk taking dimension that do not promote full sustainability.

Generally, the public partners define the performance objectives associated with the PPP projects on issues like private sector investment and development strategy and the general requirement of the public to what quality service or public facility should be. Whenever the awareness on the need for sustainability lacks, the management of the PPP projects severely limits the embracement of community-oriented approaches whilst defining the performance objectives pertaining to different PPP projects (Adams, W.M. 2001).

Finally, the local partners should also raise awareness on the benefits as well as the overall process of PPP projects. Creation of awareness of inclusion of sustainability on a PPP project should be in line with a multi-stakeholder platform. This platform facilitates discussion and ensures the different beneficiaries of the project unadventurously garner some knowledge regarding the understanding of these projects (Hearne, R. 2009).

4.11 Conclusions:

In conclusion, the inclusion of sustainability and sustainability issues is currently one of the critical challenges facing many schools PPP projects in Ireland. Although there have been a number of initiatives by both the EU and the Irish government, the public partners of the PPP school projects in Ireland are still facing a number of challenges in their efforts to include sustainability in such projects. However, the sustainability of the PPP projects is a collaborative effort, that requires significant support from both the public partners as well as the private partners. Please refer to figure 4.3 showing the mind map process for this chapter.
Generally, despite the numerous challenges, there is a number of potential solutions that can be put in place to enhance the success of the incorporation of sustainability into such projects. For example, in order to improve the awareness of the critical significance of sustainability among the private partners and other stakeholders of the PPP projects, the government could initiate various awareness campaigns on sustainability. In addition, apart from providing sufficient policy guidance with regard to the requirements of the project, the public partners could also provide subsidies such as grants, tax breaks amongst others, for the inclusion of the sustainability requirements by the private sector or facility providers.

In addition, there is also an urgent need to initiate the development of clear and
effective legal and regulatory frameworks for sustainable development, both at the state level as well as in the EU. This would not only ensure a continuous commitment to sustainability but would also help in the conflict resolution between public partners and facility providers. In most cases, both the public partners and the private sector still do not always understand the clear link between the implementation of the sustainable development goals of the project and the objectives of the procurement process. This is significantly impeding the effective inclusion of sustainability principles into the contemporary PPP school projects in Ireland. According to the UN (1987), sustainable development requires effective integration of policies as well as adoption of various holistic approaches that are geared towards the incorporation of sustainability in the projects (UN, 1987).

Finally, the most important stages of PPP projects for ensuring sustainable development are the specification and bid evaluation phases. Generally, during these stages, it is important to set clear environmental, social and economic targets of the project in line with its long-term sustainability. In most cases, it is often the responsibility of the public partners to set the sustainability principles of the project in the project output specifications, as well as include sustainability as a critical factor during the evaluation of bids. In this regard, the selection for the private partners should give significant value to the commitment to sustainability of the selected bidders and their dedication to sustainability issues. Thus, this study primarily focuses on the analysis of the framework for the delivery of educational construction projects implemented under the PPP route within the EU context, with case study projects taken from Ireland to establish current practice in relation to sustainability inclusion. This will also help to identify how the key players in the PPP market can influence the inclusion of sustainability on PPP projects.
CHAPTER: 5

CASE STUDY FINDINGS

5.0 Introduction

This chapter presents the analysis of the four case study projects undertaken. The methodology used is described in-depth in chapter 2 and is based on a multiple case study approach. Each project is individually approached to draw out findings which will be used in cross-case analysis.

The case studies were selected as stated in chapter 2. The overview of each case study is presented with a comprehensive analysis of each project based on documentation review, semi-structured interviews and observations and are detailed in this chapter.

The structure of the presented case studies starts with a project summary, followed by the case study analysis pertaining to VfM, RT and Innovation. The analysis is structured to address the case study propositions and the research questions, identified in chapter 2.

5.1 Data Collection

As indicated in chapter 2, data collection of these four case studies has been based on both primary and secondary data. The data sources used are:

- Documentation
- Interviews
- Direct observations

The process of collecting the data encompasses various issues and challenges, in order to maintain the elements of triangulation, validity and reliability, as these three elements were crucial to each case study project.
5.1.1 Issues and Challenges

The case study projects have been extracted from SB1 and SB2. Each of these are PPP School projects currently in their operational phase.

This research would firstly require an investigation of PPP projects from inception to completion. This, however, was not possible as the projects were in the early stages of operations.

Secondly, the research was initiated in 2008 as part of a postgraduate doctoral research. The data collection phase, however, had begun mid-2009 just after the completion of the SB1 projects. With the PPP projects in the early stages of the operational phase, data sensitivity was a primary issue in relation to VfM models and risk registers used by the public and private sectors. Shortcomings of secondary data were addressed using interviews.

The number of respondents interviewed depended on identifying the respondent’s involvement in each subject area, to ensure data gathered reflected the relevant data required. This was, however, largely governed by the respondent’s knowledge and expertise of research topic, the senior management position they held in the organisation, and their ability to influence change alongside with their availability and willingness to participate in the research to make a difference.

5.1.2 Case Study Propositions

The case study propositions (as stated in chapter 2) were based on the literature review documented in chapters 1, 3 and 4. The primary focus of the case study is in relation to VfM, RT and Innovation and its relationships with sustainability inclusion at various stages of the PPP project. The propositions are reiterated as follows:
• Sustainability inclusion on a PPP project is dependent on the relationship between VfM, RT and Innovation

• Inclusion of sustainability is associated with the degree of flexibility within PPP procurement

• In a PPP project, trade-offs occur between social, environmental and economic sustainability

5.2 Case Studies

The following section presents the description of the four case studies in the education sector in Ireland and implemented under the authority of DoES. All four projects are in different local authorities namely; Offaly, Portlaoise, Meath and Kildare County Councils.

5.2.1 Research Protocol

A total of 6 interviews were conducted with top officials representing public and private sector within the PPP project. They were the most knowledgeable, had the expertise of implementing PPP and were at top positions where they could influence the future PPP process.

The respondents were requested to carry out two sets of evaluations. Firstly, to determine the extent of sustainability implemented at design stage in relation to social, environment and economic and secondly, to determine at the design stage, the significance and interrelationship between VfM, RT and Innovation in relation to sustainability.

Interviews were conducted using a set of semi-structured questions focused on key design criteria (VfM, RT & Innovation) in relation to sustainability implementation. These attributes have been predetermined through literature reviews.

A summary of the feedback is shown in Table 5.1.
Table 5.1: Respondent feedback summary of all case study projects, on social, environmental and economic sustainability in relation to VfM, RT and Innovation

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Parties involved (Partnership)</th>
<th>PPP Project Social, Environmental &amp; Economic Sustainability</th>
<th>Innovation</th>
<th>RT</th>
<th>VFM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sustainable</td>
<td>Viable</td>
<td>Equitable</td>
<td>Bearable</td>
</tr>
<tr>
<td>GCSF</td>
<td>Public Sector - Private Sector - SPV</td>
<td></td>
<td>Viable project</td>
<td>2.28</td>
<td>2</td>
</tr>
<tr>
<td>PCD</td>
<td>Public Sector - Private Sector - SPV</td>
<td></td>
<td>Viable project</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>KCS</td>
<td>Public Sector - Private Sector - SPV</td>
<td></td>
<td>Viable project</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>ACS</td>
<td>Public Sector - Private Sector - SPV</td>
<td></td>
<td>Viable project</td>
<td>3</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Legend Abbreviations

Social Sustainability | Soc | Special Purpose Vehicle- | SPV
Environmental Sustainability | Env | Kildare Community School | KCS
Economic Sustainability | Eco | Athboy Community School | ACS
Risk transfer | RT | Gallen Community School, Ferbane | GCSF
Value for Money | VfM | Portlaoise Campus Development | PCD

Legend Marking

None = 1
Very Low = 2
Low = 3
Moderate = 4
High = 5
Very High = 6
Extremely High = 7
5.2.2 Schools Bundle 1 (SB1)

On 29 September 2005 the Minister for Education and Science, Mary Hanafin T.D., announced plans to provide 23 new post-primary and 4 new primary schools through the PPP procurement route. The projects targeted for delivery involved new schools in rapidly developing areas, the replacement of existing schools and new accommodation for schools formed by the amalgamation of existing schools. Of the 23 schools programme, SB1 is the first case study bundle project.

5.2.2.1 Background

By a notice published in the Official Journal of the European Communities (OJEC), 27 September 2006, the authority invited expressions of interest (EoI) from appropriately qualified parties for the design, construction, financing and operation of the 4 Schools project.

This project was carried out as a DBFO contract with a concession period of 25 years, in accordance with the terms of Project Agreement. Refer to Table 5.2. for the list of projects implemented under SB1 project. Gallen Community School Ferbane (GCSF): & St Mary’s CBS and Scoil Chriost Ri, Portlaoise – Portlaoise Campus Development (PCD) have been researched as part of the case study projects.

Case Study Project 1: Gallen Community School Ferbane (GCSF):

This school was constructed on a brownfield site, with the existing school on part of the site, accommodating approximately 330 pupils in total. The new school replaced all the existing buildings and was formed by amalgamating Ferbane Vocational School & St. Joseph’s and St. Saran’s Secondary School to provide 450 pupil places. This is the first case study project included in the research and thus is highlighted in table 5.2 above. Detail work is carried out based on the research questions and propositions and has been explained further in section 5.2.3.
Table 5.2: Schools included in SB1

<table>
<thead>
<tr>
<th>Location</th>
<th>School</th>
<th>Details</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offaly</td>
<td>Gallen Community School Fertbane</td>
<td>Amalgamation of Ferbane Vocational School &amp; St. Joseph’s and St. Saran’s Secondary School</td>
<td>450 pupil places</td>
</tr>
<tr>
<td>Offaly</td>
<td>St Rynagh’s Community College Banagher</td>
<td>Amalgamation of St. Rynagh’s Vocational School &amp; La Sainte Union</td>
<td>550 pupil places</td>
</tr>
<tr>
<td>Laois</td>
<td>St Mary’s CBS Portlaoise</td>
<td>New school building to provide 850 pupil places sharing campus with Scoil Chriost Ri</td>
<td>850 pupil places</td>
</tr>
<tr>
<td></td>
<td>Scoil Chriost Ri, Portlaoise</td>
<td>New school building to provide 850 pupil places sharing campus with St Mary’s CBS</td>
<td>850 pupil places</td>
</tr>
</tbody>
</table>

Case Study Project 2: St Mary’s CBS and Scoil Chriost Ri, Portlaoise – Portlaoise

Campus Development (PCD):

St. Mary’s and Scoil Chriost Ri were both constructed on a greenfield site in Portlaoise. There were no existing school facilities to take into account. The new school building has provided 850 pupil places each for St Mary’s and Scoil Chriost Ri, sharing the same campus; the second case study project and highlighted in table 5.2 above. Table 5.3 highlights the start and finish dates of SB1 projects. Detail working is carried out on this project based on the research question and propositions and has been explained further in section 5.2.4. Table 5.3 shows the project start and completion dates of SB1 projects.
Table 5.3 Project start and finish dates of each school project under SB1

<table>
<thead>
<tr>
<th>SB1 School</th>
<th>Start on site</th>
<th>Handover date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallen Community School Fermoy</td>
<td>2nd Jan 2008</td>
<td>15th May 2009</td>
</tr>
<tr>
<td>St Rynagh’s CC Banagher</td>
<td>2nd Jan 2008</td>
<td>21st May 2009</td>
</tr>
<tr>
<td>St Mary’s CBS, Portlaoise</td>
<td>2nd Jan 2008</td>
<td>31st March 2009</td>
</tr>
<tr>
<td>Scoil Chriost Ri, Portlaoise</td>
<td>2nd Jan 2008</td>
<td>27th Feb 2009</td>
</tr>
</tbody>
</table>

5.2.2.2 Management Structure of SB1:

This section identifies the roles of key project members on SB1 project.

**Department of Education & Science (DoES):**

The sanctioning authority was the Minister for Education and the sponsoring agency was DoES. DoES along with the appointed technical advisors were responsible for the preparation of the OS, which included the authority’s technical requirements. This was to bring a balance between traditional and PPP procurement. It was also responsible for finalising and signing off the accommodation schedule for each school under this bundle. The OS was developed based on the department’s guidance documents and standard room layouts for post-primary schools.

**National Development Finance Agency (NDFA)**

Based on the statutory legislation established on 1 January 2003, NDFA firstly acted as Financial Adviser to DoES in advising on optimal means of financing the cost of public investment projects, in order to achieve VfM and provided advice on all aspects of financing, refinancing and insurance for SB1 projects (NDFA, 2014). Secondly, as the project managers, were responsible for co-ordinating the authority’s advisers, assessment
and evaluation panels, and keeping the steering committee and project board updated on
the progress of tender evaluation.

**NDFA Board**
The NDFA Board was responsible for the PPP contract and bid management; assessment
of the best bid, most economically advantageous tender (MEAT) as determined in
accordance with the Negotiated procedure. If it fails to equal or beat the PSB, the NDFA
Board shall examine and seek guidance from the Minister of Finance, as to whether the
project should proceed as a PPP. The NDFA were also responsible to ensure appropriate
systems were in place to manage the procurement in line with regulatory and EU
requirements.

**Accountable Officer**
The Accountable Officer on SB1 for pre-procurement was DoES (Secretary General) and
for procurement was NDFA (Chief Executive Officer). They were delegated with the
authority of justifying & procuring these PPP schools project.

**Project Team**
The Project Team comprised of representatives of DoES and the NDFA; chaired by DoES
during the pre-procurement and the NDFA during the procurement stages. The following
additional members were also appointed:

- **Process Auditor**
  A process auditor was appointed in accordance with the DoF PPP Guidelines. The
  role was to support the accountable officer in checking adherence to the proper
  procedures and processes. The process auditor records each step or procedure on
  the approved procurement process checklist. In order to record that a step has been
  completed, the process auditor must be satisfied that each step has been given due
  consideration by the appropriate responsible authority.
• **Project Team Work Groups**

At certain stages throughout the project, subgroups were formed to assist the project team with technical, legal and financial advice in relation to dealing with specific issues of tender evaluation, risk assessment, payment mechanism etc. These work groups were directed by the project team responsible for carrying out the work necessary to deliver in a timely manner in accordance with the government decision. Representatives from each School attended as required.

• **Project Advisers**

To support the project team, advisers on legal, financial, technical issues etc. were appointed by DoES and NDFA.

5.2.2.3 Procurement Procedure of SB1:

The ITN document was issued to tenderers in accordance with Council Directive 2004/18/EC under the negotiated procedure (figure 5.1). Under this procedure the authority observed the general procurement principles of transparency, equality of treatment, non-discrimination and objectivity.

The main procurement stages followed on SB1 were as stated below.

- Shortlisting of tenders
- Tender Invitation Documents
- Orientation Meeting with Tenderers
- Query Procedure and Consultation Process
- Preferred Tenderer (PT) Process
- Award of Project Agreement
- Construction
- Operation and Maintenance (O&M)
- Hand Back
Figure 5.1: Negotiated procedure (National Audit Office, 2007)
5.2.2.4 Tender evaluation procedure of SB1:

Following the publication of the OJEU notice, interested parties were invited to enter into a project agreement by the Negotiated Procedure. Three tenderers prequalified and submitted their tender to NDFA on 13 July 2007. This process was managed by the DoES and NDFA. Submissions were assessed by the relevant assessment teams and an assessment report prepared and handed to the evaluation team. The evaluation team evaluates the proposals and forwards their recommendation to the project board for approval.

5.2.2.4.1 Tender evaluation process:

The tender evaluation methodology followed by the authority was as detailed in the ITN. Each tender assessment was based on a two-stage procedure, in accordance with ITN criteria:

Stage 1: Completeness/Compliance Check - Assessment was based on the conformity and contents.

Stage 2: Evaluation – Evaluation of the tenders was completed on technical, financial and legal criteria.

Stage 2 Evaluation was a two-stage process: a preliminary technical evaluation, carried out to achieve a basic understanding of each tender and the issues addressed within submissions and met the mandatory compliance requirements specified within the ITN documents. These evaluations, together with the initial legal and financial evaluations, were used to confirm if tenders could be taken forward to the detailed evaluation stage. The initial Technical Evaluation consisted of completeness and compliance checks in accordance with the ITN.
Technical, legal and financial tenders were evaluated by the respective evaluation teams.

Technical evaluation is carried out based on the criteria of the technical evaluation matrix, refer table 5.4.

**Table 5.4: Evaluation Criteria of SB1 (extract from ITN)**

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Percentage Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Technical</td>
<td></td>
</tr>
<tr>
<td>• Design</td>
<td>34.0%</td>
</tr>
<tr>
<td>• Construction</td>
<td>8.5%</td>
</tr>
<tr>
<td>• Operation</td>
<td>20.0%</td>
</tr>
<tr>
<td>2. Financial</td>
<td>Not part of this research</td>
</tr>
<tr>
<td>3. Legal</td>
<td>Not part of this research</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Similarly, legal and financial evaluations were carried out based on the appropriate evaluation matrix. The legal and financial evaluation is outside the scope of this research.

The evaluation team based on the combined technical, legal and financial evaluation recommends the highest ranked tenderer for appointment to PT.

**5.2.2.4.2 Evaluation criteria and marking matrix:**

As previously mentioned, this case study focuses on the design evaluation criteria of SB1 projects based on the three-pillar sustainability model. It focuses on the PPP technical evaluation and assesses how the project, from inception to hand back, is affected throughout the stages of PPP procurement.

Please refer to table 5.5 below, which lists the main technical criteria and sub-criteria included on SB1 project.
Once the completeness and compliance check is concluded, all compliant tenders were evaluated in accordance with the technical evaluation - award criteria. The ITN sets out the mark weightings available in respect of the award criteria.

Tenders scored higher marks where the solution offered exceeded the Authority’s specifications, by offering further added value by reference to the criteria of the ITN. The
Technical Evaluation score was added to the quantitative results from the detailed Financial and Legal Evaluations and formed the basis for a recommendation of PT to the Project Board, who in turn made a recommendation to the Steering Group and the NDFA Board. This process led to the appointment of MPfI as the PT for SB1 projects. The evaluation flowchart is presented in figure 5.2.

*Figure 5.2: SB1 Evaluation Flow Chart*
5.2.3 Case Study Project 1: Gallen Community School, Ferbane (GCSF)

GCSF is one of the four schools under SB1 project implemented by the PPP route. In this case study project sustainability assessment was carried out by the review of documents and interviews conducted. Refer to appendix 3 for school as built aerial view.

5.2.3.1 Sustainability assessment Part 1:

In this section a social, environmental and economic sustainability assessment was carried out based on document review and semi structured interviews. A weighting of 1 to 7 was given by respondents interviewed in relation to the three parameters of VfM, RT and Innovation, implemented in relation to design of social, environmental and economic sustainability over the various project stages.

a) Social Sustainability assessment:

This school site included existing school operational on-site and had river Brosna adjacent which made it challenging. The social sustainability assessment was carried out based on the document review & semi structured interviews conducted. The following social design solutions were implemented:

In summary this school design includes following social sustainability criteria as tabulated below in table 5.6:
Table 5.6: Social design criteria of GCSF

<table>
<thead>
<tr>
<th>Social Sustainability</th>
<th>Main criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Design to improve educational standards</strong>: showed learning through the landscape approach, which included specific landscaping areas to enable the school to deliver against curriculum. Included open and welcoming entrances with bright and spacious social and circulation spines. The design demonstrated clear circulation space into a learning and socially interactive environment. It had a range of flexible formal and informal learning spaces which also provided passive supervision, along with creating suitable social play spaces both internal and external.</td>
</tr>
<tr>
<td></td>
<td><strong>Uniqueness and quality of proposals that add value beyond just meeting basic accommodation needs</strong>: Local setting and community context: Formed a new urban landmark building on the outskirts of Ferbane, it maximised the strong site presence adjacent to river Brosna.</td>
</tr>
<tr>
<td></td>
<td><strong>Entrances</strong>: The location of the school was enhanced by the clear entrance, secure reception and foyer space.</td>
</tr>
<tr>
<td></td>
<td><strong>Universal access</strong>: The entire school was universally accessible,</td>
</tr>
<tr>
<td></td>
<td><strong>Way findings &amp; signage</strong>: design helped to provide a clear way for the findings and access strategy.</td>
</tr>
<tr>
<td></td>
<td><strong>Views</strong>: facilitated views from inside teaching &amp; learning areas</td>
</tr>
<tr>
<td></td>
<td><strong>Acoustics</strong>: designed with good acoustic performance, experienced by the teaching staff</td>
</tr>
<tr>
<td></td>
<td><strong>Safety and security</strong>: The safety of pupils and staff has increased due to the clear traffic management strategy.</td>
</tr>
</tbody>
</table>
Based on the above assessment, the design of this school was assessed by the respondents in relation to social sustainability inclusion, based on the three parameters of VfM, RT & Innovation which is attached in figure 5.3

b) Environmental Sustainability Assessment:

The requirements of environmental sustainability were very explicit in the output specification, with the authority making a conscious effort to convey the seriousness of inclusion of environmental requirements on this project to the bidders. The local authority, Offaly County Council also laid down conditions in relation to waste management and air pollution caused due to construction activity. The environmental sustainability requirements focused mainly around environmental and energy design strategy and environmental assessment. As explained further:

a) Environmental design: The school design was based on natural ventilation, air quality, natural daylight, heating and cooling including solar gain, glare and shading, along with acoustic insulation, and design and control strategies for heating and lighting.

- **Natural ventilation:** The Authority requirement was to achieve flow of fresh air of 8 litres/second/person for all teaching spaces. This was achieved, however, at the design stage all the rooms except home economics, art and craft and one science room were marginally below the requirements, which was rectified by opening the windows by 40%. The weather data used in simulation was American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) climate file specific to Mullingar area, as it was the closest location with a climate file in this area.

- **Natural daylight:** Authority requirement to achieve 3.5% average daylight factor for all teaching spaces was achieved and the calculations were carried out using
Commission Internationale de l’Eclairage (CIE). In case of deeper room skylights were provided, which acted as source of light as well as ventilation.

- **Heating and cooling including solar gain, glare and shading:** Space heating is provided in all rooms. Air-conditioning was not provided in any rooms as the design facilitated natural air movement using openable windows. The south-facing ground floor rooms have a large overhang which provides solar shade thus reducing solar heat gain and glare.

- **Acoustic design:** The requirement of the output specification was achieved in relation to noise and reverberation.

- **Control for heating and lighting:** The heating system is fully automatic, reacting to changing external temperature. Automatic lighting controls are installed to minimise electric consumption.

**b) Energy design:** The design was based on industry best practice for oil (heating) and electricity (lighting). The electricity is provided by the national grid and oil is sourced in an approved manner. Liquefied petroleum gas (LPG) is used in specialist rooms and stored in an approved manner onsite. MPFI proposals stated a design calculation of 23.45 kWh/m²/year for electricity and 76.50 kWh/m²/year for fossil fuel. Thus, at design stage energy efficiency was better than the good practice guide of 25 kWh/m²/year for electricity and 108 kWh/m²/year for fossil fuel. This data is currently being reviewed by the DoES against the actual usage.

**c) Environmental assessment:** This school mainly included environmental assessment of water and air; environmental impact assessment of existing site, conditions in planning, environmental impact during construction and demolition. Materials used during construction, especially timber, were from renewable sources. Construction waste was monitored, sorted and recycled onsite during construction stage. Water and
air pollution, due to site construction activities, were monitored and best practice policy adopted. A traffic impact assessment was also carried out to minimise traffic congestion and pollution.

In summary, this school included the environmental sustainability criteria tabulated in table 5.7.

**Table 5.7: Environmental design criteria of GCSF**

<table>
<thead>
<tr>
<th>Main criteria</th>
<th>Sub-criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental design</td>
<td>• Natural ventilation</td>
</tr>
<tr>
<td></td>
<td>• Natural daylight</td>
</tr>
<tr>
<td></td>
<td>• Heating and cooling including solar gain, glare and shading</td>
</tr>
<tr>
<td></td>
<td>• Acoustic design</td>
</tr>
<tr>
<td></td>
<td>• Control for heating and lighting</td>
</tr>
<tr>
<td>Energy design</td>
<td>• Target electricity consumption to be achieved</td>
</tr>
<tr>
<td></td>
<td>• Target Oil consumption to be achieved</td>
</tr>
<tr>
<td>Environmental assessment</td>
<td>• environmental impact assessment of existing site,</td>
</tr>
<tr>
<td></td>
<td>• conditions in planning,</td>
</tr>
<tr>
<td></td>
<td>• environmental impact during construction and demolition</td>
</tr>
<tr>
<td></td>
<td>• Traffic impact assessment</td>
</tr>
<tr>
<td></td>
<td>• Co2 emissions due to site activities will be monitored and reported</td>
</tr>
<tr>
<td></td>
<td>• Co2 emissions due to transport to and from site will be monitored</td>
</tr>
<tr>
<td></td>
<td>• Insulation used in the development to be zero ozone potential and will have a global warming potential of less than 5.</td>
</tr>
<tr>
<td></td>
<td>• Materials used for construction (timber) procured from renewable sources</td>
</tr>
<tr>
<td></td>
<td>• Target water consumption and how it can be reduced.</td>
</tr>
</tbody>
</table>

Based on the above assessment, the design was assessed by the respondents in relation to environmental sustainability inclusion, based on the three parameters of VfM, RT & Innovation; attached in figure 5.3
c) Economic sustainability assessment

The economic sustainability requirements were explicit for output specification. The Department of Education has well-structured Basic Building Cost (BBC) requirements, based on per square meter cost of construction for all traditional projects. All school buildings procured by traditional procurement should comply with this VfM cost. In case of PPP projects, a PSB is derived based on the BBC, which accounts for the life cycle maintenance and operational cost for the duration of the project.

The main design assessment criteria under economic sustainability are firstly, the flexibility of expansion without excessive disruption to the school; secondly, whole life cycle approach and thirdly, life cycle maintenance. These have been explained in detail below.

- **Design to demonstrate innovation in flexibility:** As per DoES technical guidance documents (TGD), all school buildings should be flexible to take expansion of 33% gross floor area (GFA) and capable of absorbing reasonable future change without excessive disruption. The proposals submitted by MPFI confirmed this school was compliant with the DoES TGD requirements.

- **Whole life cycle approach:** MPFI continually involved Sodexo, their main O&M and life cycle maintenance subcontractor, in all their design development stages. Thus, their designs reflected clear understanding of design, which had ease of O&M and life cycle maintenance approach. MPFI’s approach towards using robust materials, which will ease the operation cost, was clearly seen in their proposals. This reflected their extensive involvement in PFI projects in the UK. Thus, lessons learned were clearly demonstrated in their proposals.

- **Life cycle maintenance:** MPFI’s proposals clearly showed the life cycle maintenance approach followed. It clearly stated how the life cycle maintenance will be carried out
with minimal disruption. It also demonstrated that the life cycle asset replacement strategy was based on a selection of appropriate design components ensuring the quality of building does not deteriorate throughout the life of the project by mitigating appropriate life cycle risk.

In summary this school included the following economic sustainability criteria as tabulated in table 5.8.

**Table 5.8: Economic design criteria of GCSF**

<table>
<thead>
<tr>
<th>Economic Sustainability</th>
<th>Main criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Design to demonstrate innovation in flexibility (school to expand up to 33% gross floor area) and is capable of absorbing reasonable change in future without excessive disruption to the school.</td>
</tr>
<tr>
<td></td>
<td>• Whole life cycle approach.</td>
</tr>
<tr>
<td></td>
<td>• Life cycle maintenance</td>
</tr>
<tr>
<td></td>
<td>➢ Carry out life cycle maintenance by minimising disruption to delivery of education or extracurricular activities.</td>
</tr>
<tr>
<td></td>
<td>➢ Demonstrate life cycle asset replacement strategy.</td>
</tr>
<tr>
<td></td>
<td>➢ Demonstrate how building design and component selection has supported the life cycle maintenance of the project agreement.</td>
</tr>
<tr>
<td></td>
<td>➢ Ensure the quality of building does not deteriorate throughout the life of the project.</td>
</tr>
<tr>
<td></td>
<td>➢ Life cycle risk</td>
</tr>
</tbody>
</table>

Based on the above assessment, the design of this school was assessed by the respondents in relation to economic sustainability inclusion based on the three parameters of VfM, RT & Innovation which is attached in figure 5.3
CASE STUDY PROJECT 1: SUSTAINABILITY ASSESSMENT
(Value for Money, Risk Transfer & Innovation)

Figure 5.3: Sustainability Assessment of GCSF – Part 1
5.2.3.2 Sustainability assessment Part II: Relationship between VfM, RT and Innovation

In this section, the study sets out to explore the relationship between the three main components of PPP projects, namely VfM, RT and Innovation. The respondents were asked to distribute a weighting of 100 between the three factors, at different stages of the project life cycle in relation to three-pillar sustainability requirements. The graphical representation of the relationship between VfM, RT and Innovation are plotted between the weightings against PPP project lifecycle and shown in figures 5.4, 5.5 and 5.6.

a) VfM
Since the inception of PPP model, VfM has been one of the main drivers of PPP procurement. In this case study, the incorporation of VfM is assessed in relation to the three-pillar sustainability model i.e. Social, environmental and economic sustainability throughout the entire PPP procurement stages.

- **Social Sustainability**: The implementation of social sustainability is based on design provided by the private sector to the authority based on the requirements outlined in the output specification and the relationships developed during the negotiation phase. In relation to GCSF, the ITN requirements have been met in relation to social sustainability. The end product is based on the requirements laid out, discussions and negotiations to provide the client with VfM due to long-term commitment and is to an extent based on the expertise of the public sector.

- **Environmental Sustainability**: All risk associated with environmental sustainability is being transferred to the private sector on this project. Thus, it is in the interest of private sector to implement environmental sustainability which are legislative requirements or form part of the regulations. The planning process also implements conditions in relation to these requirements. Thus, VfM in relation to implementing
environmental sustainability is in the interest of the private sector. On this project the respondents agreed that all performance requirements in relation to ITN environmental sustainability and output specification were achieved, thus demonstrating VfM in relation to environmental sustainability.

- **Economic Sustainability**: This deals with the cost associated with the whole life cycle of the project and how the design proposed can mitigate or ease the requirements for maintenance of the building over its entire life time. The criteria laid down have been fully met in relation to economic sustainability on this project.

For GCSF all respondents collectively acknowledged that social sustainability in relation to the project design demonstrates VfM. However, the public sector still has reservations regarding the level to which VfM was achieved, as projects are still in operational stage. Furthermore, it is argued by the authority that VfM has been carried out in accordance with the Department of Finance VfM testing, which is a theoretical exercise. However, the private sector has the VfM certainty through the contract document which sets out clear evaluation criteria in form of a payment mechanism, performance-based output specification and whole life cycle cost, to future proof the assets. Refer to figures 5.4, 5.5 and 5.6 which graphically presents VfM weightings against PPP project lifecycle in relation to the three-pillar sustainability model.

b) RT

RT is another important aspect of PPP procurement. PPP got the most publicity due to its RT matrix which states the party best able to manage the risk should bear that risk. The current PPP model transfers all risk, except demand risk, to the PPP Co.

- **Social Sustainability**: The private partners’ implementation of social sustainability is by complying with the authority requirements provided in the output specification.
This depended on the expertise of the authority in developing relationships based on discussions and negotiations made with the private partners. In this project the requirements laid down in the document were demonstrated by the proposals of the private sector. In relation to social sustainability the project achieved medium response. All risks associated with design were transferred to the private sector.

- **Environmental Sustainability**: The implementation of environmental sustainability is primarily based on legislative requirements. As the risk is being transferred to the private sector, it is in their interest to implement environmental sustainability which are legislative requirements or form part of the regulations. The planning process also implements conditions in relation to these requirements. The respondents agreed that the requirements as laid down in the project documents were achieved.

- **Economic Sustainability**: This deals with the cost associated with the whole life cycle of the project. The risks associated with operation of assets remain with the private sector, thus it was in the interest of private sector to mitigate any issues arising in relation to this criterion. The respondents agreed that the requirements as laid down in the project documents were achieved in relation to economic sustainability.

The RT assessment process within PPP procurement has been agreed by all parties as the most important. The significance of ensuring the right risks are allocated to the party best able to manage them, was clearly stated by the authority. Furthermore, lessons learned from previous PPP projects, has provided an insight to clearly specify the requirement. The contract is seen as the main tool to ensure that RT assessment process is in place. Refer to figures 5.4, 5.5 and 5.6 which graphically represents RT weightings against PPP project lifecycle in relation to the three-pillar sustainability model.
c) Innovation

The private sector expertise in relation to innovation is one of the important aspects of PPP procurement. We will now assess the innovation implemented on PPPs in relation to sustainability aspects.

- **Social Sustainability**: Innovation in the provision of social sustainability is based on design provided by the private partners in response to authority requirements of output specification. All respondents agreed that design innovation was restricted, due to overly prescriptive requirements, for example; room layouts, accommodation schedules etc. Thus, Innovation in relation to social sustainability was limited.

- **Environmental Sustainability**: The implementation of environmental sustainability is primarily based on legislative requirements. As the risk is being transferred to the private sector, it is in their interest to implement environmental sustainability which are legal requirements. The planning process also implements conditions in relation to these requirements. Thus, RT in relation to implementing environmental sustainability is in the interest of private sector.

- **Economic Sustainability**: This deals with design innovation associated with the whole life cycle cost of the project. The operational risks rests with the private sector, thus it is in their interest to mitigate any issues arising in relation to risk, by proposing innovating VfM options in relation to implementing economic sustainability. This project showed minimum innovation in relation to economic sustainability, complying only with the requirements laid down in the tender documents.

Thus, the graphical representations of the relationship of the three factors concur and confirm the findings described in figures 5.4, 5.5 and 5.6. The significance of each factor is influenced by the particular stage of the project lifecycle. Subsequently, the factors are co-dependent on each other over the lifecycle of the PPP project.
Case Study Project 1: Social Sustainability: Relationship between VfM - RT - Innovation

Figure 5.4: GCSF Social Sustainability Assessment – Part 2
Case Study Project 1 Environmental Sustainability: Relationship between VfM-RT-Innovation

Figure 5.5: GCSF Environmental Sustainability Assessment – Part 2
Case study project 1: Economic Sustainability: Relationship between VfM – RT – Innovation

Economic sustainability weightage

PPP Project Life cycle

**Figure 5.6: GCSF Economic Sustainability Assessment – Part 2**
5.2.3.3 Drivers and Barriers

The GCSF PPP project’s drivers and barriers that had significant impact on the project lifecycle have been identified and presented in table 5.9. There has been an overlap between the drivers and barriers, as they play dual roles. The distinction between them is dependent on the context in which they are viewed, as well as the content they represent.

Table 5.9: Key barriers and drivers of GCSF

<table>
<thead>
<tr>
<th>Public sector</th>
<th>PPP Evaluation Technical/Legal/Financial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivers</td>
<td>• Political</td>
</tr>
<tr>
<td></td>
<td>• Social</td>
</tr>
<tr>
<td></td>
<td>• Economy</td>
</tr>
<tr>
<td></td>
<td>• Legal</td>
</tr>
<tr>
<td></td>
<td>• Technology</td>
</tr>
<tr>
<td></td>
<td>• Environmental</td>
</tr>
<tr>
<td></td>
<td>• Relationship established by partnership</td>
</tr>
<tr>
<td></td>
<td>• Value for money</td>
</tr>
<tr>
<td></td>
<td>• Risk transfer</td>
</tr>
<tr>
<td></td>
<td>• Innovation</td>
</tr>
<tr>
<td></td>
<td>• Affordability</td>
</tr>
<tr>
<td></td>
<td>• Past experience</td>
</tr>
<tr>
<td></td>
<td>• Government Commitment</td>
</tr>
<tr>
<td></td>
<td>• Cost certainty</td>
</tr>
<tr>
<td></td>
<td>• Life cycle maintenance</td>
</tr>
<tr>
<td>Barriers</td>
<td>• Lack of Policy</td>
</tr>
<tr>
<td></td>
<td>• Affordability requirements</td>
</tr>
<tr>
<td></td>
<td>• Resource available</td>
</tr>
<tr>
<td></td>
<td>• Prescriptive Output specification</td>
</tr>
<tr>
<td></td>
<td>• Lengthy Contract documents</td>
</tr>
<tr>
<td></td>
<td>• Lengthy pre-procurement process</td>
</tr>
<tr>
<td></td>
<td>• Site conditions</td>
</tr>
<tr>
<td></td>
<td>• Mind set</td>
</tr>
<tr>
<td></td>
<td>• Public perception</td>
</tr>
<tr>
<td></td>
<td>• Risk transfer</td>
</tr>
<tr>
<td></td>
<td>• Economy</td>
</tr>
<tr>
<td></td>
<td>• Uncertainties</td>
</tr>
<tr>
<td></td>
<td>• Obsolescence</td>
</tr>
<tr>
<td></td>
<td>• Trade-offs</td>
</tr>
</tbody>
</table>

5.2.3.4 Conclusion

Based on documentation review, interview sessions and data analysis, the following conclusion are made: Sustainability inclusion in relation to VfM, RT & Innovation on
GCSF project was focused primarily around complying with the requirements laid in the contract document. How these transpired in relation to the three attributes are based on the relationship formed at process level, individual level, organisational level and the partnership in its totality.

In conclusion, the GCSF project showed a greater inclination in relation to sustainability towards VfM and RT as compared to Innovation. This project clearly showed the three attributes are co-dependent and the project, as implemented, is a viable project based on the three-pillar sustainability assessment.

5.2.4 Case Study Project 2: Portlaoise Campus Development (PCD).

PCD is a campus development of two post-primary schools, *St Mary’s CBS* and *Scoil Chriost Ri*, on a single site. Refer to appendix 4 for school as built aerial view.

5.2.4.1 Sustainability assessment Part 1:

In this section an assessment of social, environmental and economic sustainability, as implemented on this campus development, was carried out based on document review and semi structured interviews. A weighting of 1 to 7 was provided by the respondents in relation to the three parameters of VfM, RT and Innovation against the three pillars of sustainability, social, environmental and economic.

a) Social Sustainability assessment:

A greenfield site with a south-facing slope which was maximised to provide a south-facing community piazza and binds the two schools with the Physical Education (PE) hall. This school design included following social sustainability criteria as tabulated below in table 5.10.
Table 5.1: Social design criteria of PCD

<table>
<thead>
<tr>
<th>Social Sustainability</th>
<th>Main criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Design to improve educational standards</strong>: The development has made the most of the existing topography, creating a modern and contemporary design solution. The Piazza binds the two schools together and forms a civic space and a strong single urban composition. It is used for a wide variety of educational, recreational and community uses, which enhance the educational value.</td>
</tr>
<tr>
<td></td>
<td><strong>Uniqueness and quality of proposals that add value beyond just meeting basic accommodation needs</strong>: School design consists of three distinctive educational clusters arranged around central social spaces and linked by a central circulation spine. A good relationship between GP Hall and Piazza allows for interaction between spaces.</td>
</tr>
<tr>
<td></td>
<td><strong>Local setting and community context</strong>: A strong civic, campus type design which has a good scale and presence when viewed from Borris Road. A central civic space - the Piazza - which binds the PE Hall, St Marys School and Scoil Chríost Rí to form a strong single urban composition.</td>
</tr>
<tr>
<td></td>
<td><strong>Entrances</strong>: The Piazza makes it easy to monitor arrivals and departures. The location of the school was enhanced by the clear entrance, secure reception and foyer space.</td>
</tr>
<tr>
<td></td>
<td><strong>Universal access</strong>: The entire school campus is universally accessible.</td>
</tr>
<tr>
<td></td>
<td><strong>Way findings &amp; signage</strong>: The school design helps in clear way findings and access strategy.</td>
</tr>
<tr>
<td></td>
<td><strong>Views</strong>: Extensive external views over the landscaped grounds and internal courtyards from classrooms.</td>
</tr>
<tr>
<td></td>
<td><strong>Acoustics</strong>: The school was designed to good acoustic standards with the input of the teaching staff.</td>
</tr>
<tr>
<td></td>
<td><strong>Safety and security</strong>: Scoil Chríost Rí, school has increased safety of pupils and staff by providing internal views along circulation spine and social spaces assist in supervision and surveillance of student activities. St Mary’s CBS pastoral and staff offices are located around the school to provide passive supervision.</td>
</tr>
</tbody>
</table>
b) Environmental Sustainability Assessment.

The Authority had made the environmental requirements explicit in the output specification. The local authority, Laois County Council laid down conditions in relation to waste management and environment pollution caused due to construction activity. The DoES has well-structured M&E guidance which states the energy targets along with energy rating to be achieved by the new build schools. The main design focus was on environmental and energy design strategy and environmental assessment. These are explained in detail below.

i) Environmental design:

- **Natural ventilation**: At design stage for **Scoil Chriost Ri** and **St Mary’s CBS** similar to Gallen Community College the weather data used in simulation was ASHRAE climate file specific to Mullingar area, the closest location with a climate file. The required flow of fresh air was 8 litres/second/person for all teaching spaces. All the rooms, except technical graphics and computer/word processing, were marginally below; this was rectified by opening the windows 40% or for a longer time.

- **Natural daylight**: It was the requirement of authority in the ITN documents to achieve 3.5% average daylight factor for all teaching spaces. For **Scoil Chriost Ri** the initial design proposal had low daylight levels, in the range of 1.8 to 3.0% with a sill height of 750mm and a window height of 1350mm. Two simulations were carried out by changing the sill and window height, which finally achieved daylight factor of 4.0 to 4.5%. Thus, all the rooms complied with the ITN document daylight requirements. In case of **St Mary’s CBS**, all rooms met the recommendation daylight factor of within 3.5% to 5.5%, as per the simulation carried out during the design stage. It was greatly influenced by roof lights.
Daylight factor calculations were carried out using CIE. Deeper rooms were provided skylights which acted as a source of light and ventilation.

- **Heating and cooling including solar gain, glare and shading**: Both the schools in Portlaoise had space heating in all rooms. Air-conditioning was not provided as the design facilitated natural air movement using open-able windows.

- **Acoustic design**: The requirement of the output specification was achieved in relation to noise and reverberation.

- **Control for heating and lighting**: Similar to Gallan Community College, *Scoil Chriost Ri* and *St Mary’s CBS* campus development had a fully automatic heating system that reacts to changing external temperatures. It also has weather compensated heating circuits with variable speed pumps, which reacts to changing conditions and speeds up or slows down as required to optimise energy consumption. Automatic lighting controls were installed to minimise electric consumption in both the schools.

ii) **Energy design**: The design of this school was based on industry best practice; gas, 108 kWh/m²/year (heating) and electricity, 25 kWh/m²/year (lighting). The electricity is provided by the national grid (Electricity Supply Board (ESB)) and the gas is from the Bord Gais Eireann network. The MPFI proposals stated a design calculation of: *Scoil Chriost Ri*, achievements of 21.54 kWh/m²/year (electricity) and 73.64 kWh/m²/year (fossil fuel) and *St Mary’s CBS*, 21.30 kWh/m²/year (electricity) and 76.08 kWh/m²/year (gas). The design achieved better results than the good practice guide. This data is under review by the authority against the actual usage as the school is operational.

iii) **Environmental assessment**: *Scoil Chriost Ri* and *St Mary’s CBS* included environmental impact assessment of existing site, conditions in planning,
environmental impact during construction and demolition. It also used materials during construction, especially timber, from renewable sources. The construction waste was monitored, sorted and recycled on site. Water and air pollution, due to site construction activities were monitored and best practice policy adopted. Traffic impact assessment was also carried out.

In summary this school design included the following environmental sustainability criteria as tabulated in table 5.11.

**Table 5.11: Environmental design criteria of PCD**

<table>
<thead>
<tr>
<th>Main criteria</th>
<th>Sub-criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental design</td>
<td>Natural ventilation</td>
</tr>
<tr>
<td></td>
<td>Natural daylight</td>
</tr>
<tr>
<td></td>
<td>Heating and cooling including solar gain, glare and shading</td>
</tr>
<tr>
<td></td>
<td>Acoustic design</td>
</tr>
<tr>
<td></td>
<td>Control for heating and lighting</td>
</tr>
<tr>
<td>Energy design</td>
<td>Target electricity consumption to be achieved</td>
</tr>
<tr>
<td></td>
<td>Target Gas consumption to be achieved</td>
</tr>
<tr>
<td></td>
<td>Target Oil consumption to be achieved</td>
</tr>
<tr>
<td>Environmental assessment</td>
<td>Environmental impact assessment of existing site,</td>
</tr>
<tr>
<td></td>
<td>Conditions in planning,</td>
</tr>
<tr>
<td></td>
<td>Environmental impact during construction and demolition</td>
</tr>
<tr>
<td></td>
<td>Traffic impact assessment</td>
</tr>
<tr>
<td></td>
<td>Co2 emissions due to site activities will be monitored and reported.</td>
</tr>
<tr>
<td></td>
<td>Co2 emissions due to transport to and from site will be monitored.</td>
</tr>
<tr>
<td></td>
<td>Insulation used in the development to be zero ozone potential and will have a</td>
</tr>
<tr>
<td></td>
<td>global warming potential of less than 5.</td>
</tr>
<tr>
<td></td>
<td>Materials used for construction (timber) procured from renewable sources</td>
</tr>
<tr>
<td></td>
<td>Target water consumption and how it can be reduced.</td>
</tr>
</tbody>
</table>
c) Economic Sustainability assessment.

The requirements of economic sustainability were explicit in the output specification. The DoES has well-structured basic building cost (BBC) requirements, a cost/m² of construction for all traditional projects. All school buildings procured by traditional procurement should comply with this cost for VfM. Similarly, on PPP projects, PSB is derived using BBC, which accounts for the life cycle maintenance, operational cost, etc, based on the PPP financial model for the duration of the project. Listed below are the main design criteria under economic sustainability.

Similar to GCSF, the main design assessment criteria under economic sustainability for PCD were threefold, (i) the flexibility of expansion without excessive disruption to the school, (ii) whole life cycle approach and (iii) the life cycle maintenance, as explained in detail below.

- **Design to demonstrate innovation in flexibility**: As per DoES TGD, all school buildings should be flexible to take expansion of 33% GFA and is capable of absorbing reasonable future change without excessive disruption to the school. The proposals submitted by MPFI showed that PCD was compliant with the DoES TGD requirements at both the schools and shared facilities.

- **Whole life cycle approach**: MPFI demonstrated at design stages, the continuous involvement of Sodexo, their main O&M and life cycle maintenance subcontractor, in all their design development stages and hence their designs reflected clear understanding of ease of O&M and the life cycle maintenance approach. MPFI’s approach towards using robust materials to ease the operation cost was clearly evidenced in their proposals.

- **Life cycle maintenance**: MPFI Proposals MPFI clearly showed the life cycle maintenance approach followed by PCD. It clearly stated how the life cycle
maintenance would be carried out with minimal disruption to the delivery of education or extracurricular activities. It also demonstrated that the life cycle asset replacement strategy was based on the selection of appropriate design components to support the life cycle maintenance, as stated in the project agreement and ensuring the quality of building does not deteriorate throughout the life of the project, by mitigating appropriate life cycle risk.

In summary this campus development included the following economic sustainability criteria as tabulated in table 5.13.

**Table 5.12: Economic design criteria of PCD**

<table>
<thead>
<tr>
<th>Economic Sustainability</th>
<th>Main criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design to demonstrate innovation in flexibility (school to expand up to 33% gross floor area) and is capable of absorbing reasonable change in future without excessive disruption to the school.</td>
</tr>
<tr>
<td></td>
<td>Whole life cycle approach.</td>
</tr>
<tr>
<td></td>
<td>Life cycle maintenance</td>
</tr>
<tr>
<td></td>
<td>Carry out life cycle maintenance by minimising disruption to delivery of education or extracurricular activities.</td>
</tr>
<tr>
<td></td>
<td>Demonstrate life cycle asset replacement strategy.</td>
</tr>
<tr>
<td></td>
<td>Demonstrate how building design and component selection has supported the life cycle maintenance of the project agreement.</td>
</tr>
<tr>
<td></td>
<td>Ensure the quality of building does not deteriorate throughout the life of the project.</td>
</tr>
<tr>
<td></td>
<td>Life cycle risk</td>
</tr>
</tbody>
</table>
CASE STUDY PROJECT 2: SUSTAINABILITY ASSESSMENT
(Value for Money, Risk Transfer & Innovation)

Figure 5.7 Sustainability Assessment of PCD – Part 1
5.2.4.2 Sustainability assessment Part II: Relationship between VfM, RT and Innovation

In this section the study will explore the relationship between the three main components of PPP projects, VfM, RT and Innovation on the PCD project. The respondents of this PPP project were asked to distribute a weighting of 100 between the three factors at different stages of the project life cycle, in relation to three-pillar sustainability requirements. The graphical representation of the relationship between VfM, RT and Innovation are plotted between the weightings against PPP project lifecycle and shown in figures 5.8, 5.9 and 5.10.

a) VfM

VfM has been one of the main drivers of PPP procurement. In PCD case study project we will assess how the design of this development incorporates VfM in relation to the three-pillar sustainability model, social, environmental and economic sustainability, throughout the entire PPP procurement stages.

- Social Sustainability: The basis of implementing social sustainability in the design of a project is how the private sector interprets the authority requirements as presented in the ITN and the relationships developed between the two during the negotiation phase. In relation to PCD, the respondents agreed that the ITN requirements have been met in relation to social sustainability. The respondent also mentioned that a campus development in itself demonstrates social partnership and is further enhanced by the use of shared facilities, initiated by the authority. The end product is based on the requirements laid out, discussions and negotiations undertaken to provide the client with VfM, due to long-term commitment is greatly reliant on the expertise of the private sector.
• **Environmental Sustainability:** All risks associated with environmental sustainability are being transferred to the private sector in a PPP model. Thus, it is in the interest of private sector to implement environmental sustainability which are legislative requirements or form part of the regulations. The planning process also implemented conditions in relation to these requirements. Thus, VfM in relation to implementing environmental sustainability is in the interest of private sector. However, the design of *Scoil Chriost Ri* was a courtyard design and it was argued that the daylight requirements can be compromised, meaning more consumption of power as compared to *St Mary’s CBS*. On this project the respondents agreed that all performance requirements as laid down in relation to environmental sustainability in the ITN and output specification were achieved at design stage. However, the operation stages need to be monitored to see if the design proposed achieves the requirements. Thus, there was mixed opinions to VfM in relation to environmental sustainability.

• **Economic Sustainability:** This deals with the cost associated with the whole life cycle of the project and how the design proposed can mitigate or ease the maintenance of the building over its entire life time. The respondents agreed that the criteria laid down on this site have been reasonably met at design stage in relation to economic sustainability.

In relation to PCD all respondents collectively acknowledged that the proposed design demonstrates VfM in the current time. However, the public partners still have reservations in relation to VfM as the projects are still in their operational stage. The VfM testing of these projects is based on Department of Finance VfM testing which still remains theoretical.

For the private sector, VfM is in demonstrating the performance criteria set out by the authority and how they are compiled and fully met. However, the private sector has the
VfM certainty through the contract document which sets out clear evaluation criteria in form of payment mechanism, performance-based output specification and whole life cycle cost to future proof the assets. Please refer to figures 5.8, 5.9 and 5.10 which graphically present PCD VfM weightings against PPP project lifecycle in relation to the three-pillar sustainability model.

b) RT

RT is another important aspect of the PCD project carried out by the PPP procurement route. The current PPP model as implemented on PCD, transfers all risk apart from the demand risk to the private sector.

- **Social Sustainability:** RT of design, in relation to implementation of social sustainability requirements provided by the private sector to authority, is outlined in output specification. This is achieved by the authority’s commitment and expertise authority in securing the requirements, as laid down in the output specification, based on the relationships developed through discussions and negotiations. In relation to social sustainability the project achieved medium response. In this project all risks associated with design were transferred to the private partners.

- **Environmental Sustainability:** The implementation of environmental sustainability is primarily based on legislative requirements. As the risk is being transferred to the private sector, it is in the interest of private sector to implement environmental sustainability which are legislative requirements or form part of the regulations. The planning process also implements conditions in relation to these requirements. Thus, RT in relation to implementing environmental sustainability is in the interest of private sector. The respondents agreed that the requirements as laid down in the project documents were achieved. However, it was also noted that this model
transferred all design related risks to the private sector but paid services bills directly, which raised concern over the transfer of risk.

- **Economic Sustainability:** This deals with the cost associated with the whole life cycle of the project. The risks associated with the operation of assets remain the private sector’s responsibility, thus it was in the interest of private sector to mitigate any issues arising in relation to this criterion. The respondents agreed that the requirements as laid down in the project documents were achieved in relation to economic sustainability. However, the running services cost was still the responsibility of public sector which raised concern over the economics achieved for the running of the facility.

The RT assessment process within the PPP procurement has been agreed by all parties as being the most important of all. The significance of ensuring that the right risks are allocated to the party best able to manage them, a principal stressed by the authority from the start. Furthermore, the learning curve by the authority from previous PPP projects has provided an insight to clearly specify their project objectives in the project brief. The mechanisms within the contract are seen as the main tool to ensure that RT assessment process is in place. A clear indication as to who is responsible for the specified risks is being carried out at risk workshops and identified in the documents. The risk register is a part of the contract and again it is through the contract that this characteristic is attained. Please refer to figures 5.8, 5.9 and 5.10 which graphically present RT weightings in case of PCD against PPP project lifecycle in relation to the three-pillar sustainability model.
c) Innovation

Innovation is one of the main reasons for adopting the PPP route. The private sector expertise in relation to Innovation is one of the important aspects of PPP procurement. We will now assess the innovation implemented on PSF project in relation to three-pillar sustainability aspects.

- **Social Sustainability:** In case of PSF, Innovation in social sustainability was based on the design provided by the private sector to authority’s requirements. It also relies on the authority’s expertise in achieving the best for the project by the relationship developed based on discussions and negotiations to provide the school with best value as a long-term commitment. However, all respondents agreed that design Innovation on this project was restricted due to excessively prescriptive requirements, e.g. room layouts, accommodation schedules, to detail requirements in relation to design etc. Thus, innovation in relation to social sustainability was limited. However, the building design demonstrated innovation in relating the building to the surrounding area.

- **Environmental Sustainability:** The implementation of environmental sustainability is primarily based on legislative requirements. As the risk is being transferred to the private sector it is in their interest to implement environmental sustainability in accordance with legislative requirements or form part of the regulations. The planning process also implements conditions in relation to these requirements. Thus, respondents collectively agreed that innovation in relation to environmental sustainability on this project was limited to requirements as laid in DoES TGD and building regulations, which formed part of the requirements.

- **Economic Sustainability:** This deals with design innovation associated with the whole life cycle of the project. The risks associated with operation of the assets remain with
the private sector, thus it is in their interest to mitigate any issues arising in relation to operation of the project, by proposing innovative VfM options in relation to implementing economic sustainability. This project showed minimal innovation in relation to economic sustainability, it only complied with the requirements as laid down in the tender documents.

Thus, the graphical representations of the relationship of the three factors concur and confirm the findings described in figures 5.8, 5.9 & 5.10. The significance of each factor is influenced by the particular stage of the project lifecycle. Subsequently, the factors are co-dependent on each other over the lifecycle of the PPP project.
Figure 5. 8 PCD Social Sustainability Assessment - Part 2
Case Study project 2: Environmental Sustainability: Relationship VfM - RT - Innovation

Figure 5.9 PCD Environmental Sustainability Assessment - Part 2
Case study project 2: Economic Sustainability: Relationship VfM – RT - Innovation

Figure 5. 10 PCD Economic Sustainability Assessment- Part 2
5.2.4.3 Drivers and Barriers

The drivers and barriers with regards to the PCD have been identified and presented in Table 5.13. In some instances, there was an overlap between the drivers and barriers as they play dual roles. The distinction between them is dependent on the context in which they are viewed, along with the content they represent.

*Table 5.13: Key drivers & barriers of PCD*

<table>
<thead>
<tr>
<th>Public sector</th>
<th>PPP Evaluation</th>
<th>Technical/Legal/Financial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivers</td>
<td>Similar drivers as GCSF, this is due to projects been bundled to make economic viability for PPP implementation.</td>
<td></td>
</tr>
<tr>
<td>Barriers</td>
<td>Similar Barriers as GCSF as they are based on the same requirements as laid out in the OS.</td>
<td></td>
</tr>
</tbody>
</table>

5.2.4.4 Conclusion

Based on the documentation review, interview sessions and data analysis, the following conclusion are made:

Sustainability inclusion in relation to VfM, RT & Innovation on PCD has focused primarily around complying with the requirements laid in the contract document. The design requirements of the project were based around the concept of ‘cradle to grave’. How these transpired in relation to the three attributes, was based on the relationship formed at process level, individual level, organisational level and the partnership in its totality.

Thus, in conclusion the PCD project showed greater inclination in relation to sustainability towards VfM and RT as compared to Innovation. Thus, this project clearly
showed that these three attributes are related and the project as implemented is inclined more towards a viable sustainable project.

5.2.5 Schools Bundle 2(SB2)


5.2.5.1 Background

SB2 Schools were selected in accordance with the DoES published prioritisation criteria. All the post-primary schools included resulted from amalgamations which the department afforded top priority (refer to Table 5.15). These schools provided new accommodation for just under 4,500 pupils and have been procured for DoES by the NDFA, who also acted as financial advisors for this project.

SB2 consisted of six schools on five sites in the following counties: Cork, Limerick, Kildare, Wicklow and Meath, and for the very first time included a primary and post-primary school located on the same site, within a single campus refer Table 5.15. The project cost was in the region of €120 million (Reeves, E. 2013).

*Case Study Project 3: Kildare Community School (KCS)*: This site was a greenfield site located on the northern edge of Kildare Town. It was a relatively flat site and was bounded by the county road to the east. To the south, the site is partly bounded by a cemetery and further green pasture. To the west and north, pasture bounds the site. It caters for projected long-term enrolment of 800 pupils and is formed by amalgamating with St. Joseph’s Academy, Presentation Secondary School and Vocational School. This project is the third case study project included in this research and thus is highlighted in Table 5.15 below.
Table 5.15 highlights the SB2 projects start and finish dates. Detail working is carried out on this project based on the research question and propositions and has been explained further in Section 5.2.6.

**Table 5.14: Schools included in SB2:**

<table>
<thead>
<tr>
<th>Location</th>
<th>School</th>
<th>Type</th>
<th>Details</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kildare</td>
<td>Kildare Town CS</td>
<td>Post-</td>
<td>Amalgamation of St. Joseph’s Academy, Secondary School and Presentation School</td>
<td>1000 pupil places</td>
</tr>
<tr>
<td>Cork</td>
<td>Bantry CS</td>
<td>Post-</td>
<td>Amalgamation of St. Goban’s College and Ard Scoil Phobail</td>
<td>650 pupil places</td>
</tr>
<tr>
<td></td>
<td>GS Bheanntraí</td>
<td>Primary</td>
<td>To provide permanent school for Gaelscoil established in 1994</td>
<td>8 classroom school</td>
</tr>
<tr>
<td>Meath</td>
<td>Athboy CS</td>
<td>Post-</td>
<td>Amalgamation of St. Joseph’s Secondary School and St. James’ Vocational School</td>
<td>950 pupil places</td>
</tr>
<tr>
<td>Limerick</td>
<td>Abbeyfeale CC</td>
<td>Post-</td>
<td>Amalgamation of St Ita’s College, St Joseph’s Secondary School and Vocational School</td>
<td>850 pupil places</td>
</tr>
<tr>
<td>Wicklow</td>
<td>Wicklow Town CC</td>
<td>Post-</td>
<td>Amalgamation of Abbey Vocational School &amp; De La Salle Secondary School</td>
<td>1000 pupil places</td>
</tr>
</tbody>
</table>

**Case Study Project 4: Athboy Community School (ACS):** A greenfield site located on the outskirts of Athboy, County Meath. The land rolls gently as it gradually climbs towards the east. It is bounded to the south-west by the grounds of the existing Athboy Vocational School, which itself lies on the north side of the N51 road and to the south by the long-established housing of James’ Terrace. To the north and east lie open fields, some arable & some in pasture. To the west, towards the historic town centre, the site is bounded by new housing estates. This school was formed by the amalgamation of St. Joseph’s Secondary School and St. James’ Vocational School and caters for a projected long-term enrolment of 950 pupils. This project is the fourth case study project included
in this research and is highlighted in Table 5.14 above. Detail working is carried out on this project based on the research question and propositions and has been explained further in Section 5.2.7, page 89. Refer to table 5.15 for the start and completion dates for SB2 projects.

**Table 5.15 Project start and finish dates of each school project under SB2 (Source: National Development Finance Agency, 2014)**

<table>
<thead>
<tr>
<th>SB2 School</th>
<th>Start on site</th>
<th>Handover date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kildare Town CS</td>
<td>11&lt;sup&gt;th&lt;/sup&gt; Dec 2011</td>
<td>9&lt;sup&gt;th&lt;/sup&gt; Nov 2012</td>
</tr>
<tr>
<td>Bantry CS &amp; GS Bheanntrai</td>
<td>12&lt;sup&gt;th&lt;/sup&gt; July 2010</td>
<td>5&lt;sup&gt;th&lt;/sup&gt; Aug 2011</td>
</tr>
<tr>
<td>Athboy CS</td>
<td>15&lt;sup&gt;th&lt;/sup&gt; Aug 2010</td>
<td>6&lt;sup&gt;th&lt;/sup&gt; July 2011</td>
</tr>
<tr>
<td>Abbeyfeale CC</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Jan 2009</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; Aug 2010</td>
</tr>
<tr>
<td>Wicklow Town CC</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; Nov 2011</td>
<td>25&lt;sup&gt;th&lt;/sup&gt; Dec 2012</td>
</tr>
</tbody>
</table>

5.2.5.2 Procurement Procedure of SB2 (ITPD/ITN):

SB2 project was procured by means of a PPP involving a DBFOM contract though a competitive dialogue procurement procedure. Refer to Figure 5.11 Competitive Dialogue. The procurement of SB2 was divided into two main phases; Pre-procurement and Procurement (including Planning). These are explained in detail below.
Figure 5.11: Competitive Dialogue Procedure (National Audit Office, 2007)
5.2.5.3 Management structure of SB2:

The following provides a list of key players from Authority (public sector) involved with the Project. The list is similar to management structure as followed on SB1 project. The only difference was a dedicated project manager to manage the process from NDFA was appointed from the start of the project along with the process auditor.

Refer to figure 5.12 for management structure followed on SB2 PPP projects.
Figure 5.12: SB2 Management Structure
5.2.5.4 Tender evaluation procedure of SB2:

A contract notice was published in the OJEU and on eTenders on 20 May 2008, inviting interested parties wishing to prequalify for SB2 project. These statutory advertisements were also supplemented with tender notices in the national press. Submissions were received from seven consortia and following an evaluation, three candidates were shortlisted and issued with an ITPD.

During the dialogue process, each of the shortlisted candidates confirmed to the authority that they were unable to comply with ITPD in relation to the fixed price tender due to volatility in the funding markets. In order to address this issue, the authority determined, in accordance with Regulation 31(a) of the procurement regulations, to proceed with the competition in accordance with the negotiated procedure. The authority declared end of the competitive dialogue procedure and issued an ITN to the tenderers on 10 June 2009.

a) Technical Evaluation Procedure of SB2:

The tender evaluation procedure followed on SB2 was as outlined in the ITN (refer to figure. 5.13). Each tender assessment was based on two stage evaluation procedure.

Stage 1: Compliance check- The compliance check assessment was in accordance with ITN requirements.

Stage 2: Assessment / Evaluation - Assessment of the tender was done in accordance with the ITN evaluation criteria. Marks were awarded to each submission using the detailed evaluation criteria as contained in ITN document. Each tenderer in accordance with the ITN evaluation criteria received a ranking.
Figure 5.13: SB2 Evaluation Flow Chart
As previously stated, financial and legal assessment of the tenders is outside the scope of this research. Financial assessment was carried out in accordance with the evaluation criteria in the ITN and accordingly marks were allocated. The legal review of the tenders was undertaken by the legal review team. The purpose of this review was to check the contents and confirm conformity of the tender materials with the ITN. SB2 had no marks allocated for the legal assessment as the project agreement terms were agreed and finalised prior to issue of the ITN. The evaluation team recommended the highest ranked tenderer to be appointed as PT.

b) Evaluation Criteria and Marking Matrix of SB2:

This case study only focuses on the design technical evaluation criteria of SB2 projects based on the three-pillar sustainability model as illustrated in Table 5.16. The overall marks allocated for technical was 70% and had two main core criteria of design and construction (50%) and operation (20%).

Table 5.16: SB2 Award Criteria (Source: www.etenders.gov.ie)

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Percentage Weighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Technical</td>
<td>70%</td>
</tr>
<tr>
<td>1.1 Design and Construction</td>
<td>50%</td>
</tr>
<tr>
<td>1.2 Operation</td>
<td>20%</td>
</tr>
<tr>
<td>2. Financial</td>
<td>(Not part of this research)</td>
</tr>
<tr>
<td>3. Legal</td>
<td>(Not part of this research)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
</tr>
</tbody>
</table>
The technical evaluation was further divided into sub-criteria as follows: design and construction quality, Functionality and Operations and were further had sub-criteria’s. Please refer to Table 5.17.

Table 5.17: Technical Award Criteria of SB2 (Source: www.etenders.gov.ie)

<table>
<thead>
<tr>
<th>CRITERIA Sub-Criteria</th>
<th>Marks Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-Sub-Criteria</td>
<td>%</td>
</tr>
<tr>
<td>DESIGN AND CONSTRUCTION</td>
<td></td>
</tr>
<tr>
<td>Design and Construction Quality</td>
<td></td>
</tr>
<tr>
<td>Design Quality</td>
<td>25</td>
</tr>
<tr>
<td>Quality of Construction</td>
<td>10</td>
</tr>
<tr>
<td>Sub Total</td>
<td>35</td>
</tr>
<tr>
<td>Functionality</td>
<td></td>
</tr>
<tr>
<td>Uses</td>
<td>5</td>
</tr>
<tr>
<td>Spaces</td>
<td>5</td>
</tr>
<tr>
<td>Access</td>
<td>5</td>
</tr>
<tr>
<td>Sub Total</td>
<td>15</td>
</tr>
<tr>
<td>OPERATION</td>
<td></td>
</tr>
<tr>
<td>Maintenance and Operability</td>
<td>10</td>
</tr>
<tr>
<td>Services</td>
<td>7</td>
</tr>
<tr>
<td>PPP Co Management</td>
<td>3</td>
</tr>
<tr>
<td>Sub Total</td>
<td>20</td>
</tr>
<tr>
<td>TOTAL</td>
<td>70</td>
</tr>
</tbody>
</table>

Tenders were evaluated objectively and transparently against the weighted criteria in accordance with the ITN document. Scores were allocated using objective evidence and the professional judgment of the members of the evaluation team, as appropriate. The technical assessment/evaluation was undertaken in accordance with the tender technical evaluation procedure as documented in the ITN.

Marks were awarded on a comparative basis against the authority’s requirements and the other Tenderers’ Tenders. Tenders scored higher marks where the solution offered exceeded the authority’s specifications in such a way that it offers further added value by reference to
the criteria set out in the ITN. The authorities then compiled the Financial and Technical marks for each Tenderer and ranked them according to the total number of marks gained. An Evaluation Report together with the recommendation for PT was compiled and presented to the Project Team for consideration and recommendation.

5.2.6 Case Study Project 3: Kildare Town Community School (KCS).
KCS is one of the five post-primary schools under the SB2 project. In this case study project, sustainability assessment is carried out based on document review and interviews conducted. Refer to appendix 5 for school as built aerial view.

5.2.6.1 Sustainability assessment Part 1:
This section assesses the relationship to social, environmental and economic sustainability implemented. This was done based on document review and semi structured interviews. A weighting of 1 to 7 was given by the respondents in relation to the three parameters of VfM, RT and Innovation implemented in relation to design of social, environmental and economic sustainability.

a) Social sustainability assessment:
This school site is located in the town lands of Crockanure Glebe, Kildare town on 4.983 hectares, almost flat with a cemetery to the south. This new school amalgamated St. Joseph’s Academy, Presentation Secondary School and Kildare Vocational School to become the KCS. The new school caters for 1000 pupils and associated staff. The design of this school showed some remarkable solutions in relation to social sustainability as follows. KCS included following social sustainability criteria which are tabulated below in table 5.18.
### Table 5.1: Social design criteria of KCS

<table>
<thead>
<tr>
<th>Social Sustainability</th>
<th>Main criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Design to improve educational standards:</strong> The school was proposed as a two-storey building arranged around a central courtyard. The main entrance at the south east corner leading into the multi-storey G.P. area, from which circulation leads north and west to teaching accommodation. The Special Needs Unit can be accessed off the general school circulation and also has a separate entrance adjacent to car set down.</td>
</tr>
<tr>
<td></td>
<td><strong>Uniqueness and quality of proposals that add value beyond just meeting basic accommodation needs:</strong> The design of the school around a courtyard demonstrated clear circulation space into a learning and socially interactive environment. The courtyard is the heart of the school design and provides good connectivity with the adjacent functions such as G.P area, pastoral room, art &amp; craft room etc. It has a range of flexible, formal and informal learning spaces which also provide passive supervision, for example pastoral rooms located at social areas to facilitate supervision thus enhancing suitable social play spaces internal as well as external.</td>
</tr>
<tr>
<td></td>
<td><strong>Local setting and community context:</strong> It was a condition of planning to locate the building along Dunmurray road to provide high quality frontage to the road. The contemporary design of the building is appropriate in its location and setting.</td>
</tr>
<tr>
<td></td>
<td><strong>Entrances:</strong> The location of the school was enhanced by the clear entrance, secure reception and foyer space.</td>
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<tr>
<td></td>
<td><strong>Access for all:</strong> The entire school was universally accessible</td>
</tr>
<tr>
<td></td>
<td><strong>Way finding &amp; signage:</strong> This school design clearly helped way findings and access strategy to enable all to access the circulation.</td>
</tr>
<tr>
<td></td>
<td><strong>Sun paths &amp; views:</strong> The design maximised on sun heat and keeping the views from inside out.</td>
</tr>
<tr>
<td></td>
<td><strong>Acoustics:</strong> The school was designed to good acoustic standards that are well appreciated by the end users.</td>
</tr>
<tr>
<td></td>
<td><strong>Safety and security:</strong> The school enhanced the safety of pupils and staff due to clear traffic management strategy.</td>
</tr>
</tbody>
</table>
b) Environmental sustainability assessment of project.

The requirements for environmental sustainability were explicit in the output specification in this section the various environmental sustainability criteria, as implemented on KCS, will be identified and how the requirements of output specification influenced the design of the existing school will be outlined. Along with the authority requirements, the Kildare County Council also implemented conditions in relation to protection of the environment, mainly through waste management and control of environment pollution caused due to construction activity. The KCS focus was on environmental, energy design strategy and environmental assessment. This is explained further in detail.

i) Environmental Services Strategy

- **Natural Ventilation:** Simulations were carried out at design stage to demonstrate compliance with building regulations part L satisfactorily.

- **Air Quality:** Simulations to analyse the levels of CO2 were carried out at design stage and followed levels recommended by Chartered Institution of Building Services Engineers (CIBSE).

- **Natural Daylight:** Detailed daylight simulations were carried out which demonstrated compliance with the authority’s requirements.

- **Solar Gain:** Simulations to check the room temperature and demonstrate compliance with building regulations part L.

- **Control Strategies:** A building energy management system is in place which helps to reduce energy consumption and CO2 emissions, improve comfort and allow ease of control, operation and monitoring / targeting.

- **Short-term flexibility / Longer Term adaptability:** Additional space has been allowed for future expansion of plant. Spare capacity has been incorporated into
cable containment systems. Additional CCTV camera points shall be wired to strategic locations around the building, to allow the future expansion of the CCTV system by simply adding new cameras which exceeds the authority’s requirements.

**ii) Energy Strategy**

In case of KCS, a detailed in-depth report describing all the energy strategy and environmental services strategy was presented in accordance with the authority’s requirements. The report met the authority’s requirements and exceeds them in some cases as listed below.

- **Consumption:** The tenderer predicted, at design stage, that KCS would achieve at least A3 building energy rating. This would be achieved by providing highly insulated and well-sealed building envelope, high performance glazing system, natural ventilation, maximum use of natural daylight and concrete thermal mass used as heat sink.

- **Sources:** KCS electrical supply is provided through the national grid. KCS Photovoltaics would contribute to 4.5% of the annual electrical demand.

- **Energy Usage & Cost:** The following energy saving measures were proposed:
  - Lighting control systems and energy efficient lamps
  - Variable speed control to extract fans
  - Air tight construction with an air permeability of 3 m³/m²/hr at 50Pa
  - Rainwater harvesting

- **Energy Management:** A building management system (BMS) was proposed for KCS. Additional sub metering was also provided to monitor energy use.
iii) Environmental Assessment

The tenderer presented on KCS a very detailed, in-depth high-quality report describing all the elements of the proposed facility’s environmental characteristics in close relation to the Authority’s requirements. The proposal met and, in some cases, exceeded the authority’s requirements as outlined below.

- **Sustainable Approach**: Building Research Establishment Environmental Assessment Method (BREEAM) was used to assess the following:
  - Impacts of buildings on the environment
  - Ensures best environmental practice is incorporated
  - Identifies where the DoES standards have been surpassed

Detailed analysis was carried out by meeting the authority’s requirements set out in Schedule 3 of the project agreement against BREEAM credits available. An average of 30% more credits were achieved when compared with the authority requirements.

The tenderer used the non-domestic energy assessment procedure (NEAP) to determine KCS will perform on average 15% better than the heating benchmark and on average 25% better than the electrical benchmark. However, it was highlighted that the figure of 25% excludes the equipment load; including the equipment load KCS would perform approx. 6% better than the authority electrical benchmark.

- **Approach to Sustainable Management**: The tenderer highlighted that the following would be carried out:
  - Seasonal commissioning to ensure optimum efficiency
  - CO2/Energy arising from site activities would be monitored
  - Water consumption from site activities would be monitored
• Best Practice polices with respect to air and water pollution would be adopted
• Source timber from sustainable managed sources

• **Compliance with Part L:** The tenderer has used the NEAP to compare KCS against the reference building and the results indicated a much better performance. On KCS at design stage the tenderer proposed to increase the overall building U-value by 50% over the Part L compliance requirements and a Carbon Performance Coefficient of 0.53 was proposed, which was a 47% improvement on the maximum permitted energy performance coefficient of 1.0 allowed under the prevailing regulations.

• **Environmental Statement:** A preliminary environmental statement was prepared based on the Flora and Fauna, Soil and Water preservation.

• **Specific Green features, which exceed the authority’s requirements:**
  • Water Consumption 50% better than DoES benchmark
  • Air pollution reduced by the selection of low NOx emission boilers
  • A3 Building Energy Rating
  • Use of Photovoltaics to contribute to 4.5% of the annual electrical demand.
  • Air Tightness of 3 m³/m²/hr at 50Pa
  • Rainwater Harvesting
  • LED lighting for external lights
  • Non-technical user guide to assist school principals
  • Additional energy meters
  • A rated building material
  • Minimising construction waste

In summary this school design included following environmental sustainability criteria as tabulated below in table 5.19:
### Table 5.19: Environmental design criteria of KCS

<table>
<thead>
<tr>
<th>Main criteria</th>
<th>Sub-criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental design</td>
<td>• Natural ventilation&lt;br&gt;• Air Quality&lt;br&gt;• Natural daylight&lt;br&gt;• Heating and cooling including solar gain, glare and shading&lt;br&gt;• Control for heating and lighting&lt;br&gt;• Short-term flexibility/ Longer term adaptability</td>
</tr>
<tr>
<td>Energy design</td>
<td>• Target electricity consumption to be achieved&lt;br&gt;• A3 building energy rating&lt;br&gt;• Target Gas consumption to be achieved&lt;br&gt;• Target Oil consumption to be achieved</td>
</tr>
<tr>
<td>Environmental assessment</td>
<td>• Use of BREEAM assessment tool.&lt;br&gt;• Environmental impact assessment of existing site,&lt;br&gt;• conditions in planning,&lt;br&gt;• Environmental impact during construction and demolition&lt;br&gt;• Traffic impact assessment.&lt;br&gt;• Co2 emissions due to site activities will be monitored and reported.&lt;br&gt;• Co2 emissions due to transport to and from site will be monitored.&lt;br&gt;• Air pollution reduced by using low NOx emission boilers.&lt;br&gt;• Insulation used in the development to be zero ozone potential and will have a global warming potential of less than 5.&lt;br&gt;• Materials used for construction (timber) procured from renewable sources and use of A rated construction materials.&lt;br&gt;• Target water consumption 50 % better than DoES benchmark.&lt;br&gt;• Use of Photovoltaic to contribute electrical demand&lt;br&gt;• Rain water harvesting.</td>
</tr>
</tbody>
</table>
c) Economic Sustainability assessment

The first main design assessment criteria under economic sustainability are the flexibility of expansion without excessive disruption to the school, the whole life cycle approach and the life cycle maintenance. These are explained in detail below.

- **Design to demonstrate innovation in flexibility**: As per DoES TGD, all school buildings should be flexible to take expansion of 33% GFA and is capable of absorbing reasonable future change without excessive disruption to the school. The proposals submitted by MPFI showed that PCD was compliant with the DoES TGD requirements at KCS.

- **Whole life cycle approach**: MPFI continually involved Sodexo, their main O&M and life cycle maintenance subcontractor in all their design development stages. Thus, their designs reflected clear understanding of design which had ease of O&M and life cycle maintenance approach. MPFI’s approach towards using robust materials which will ease the operation cost was clearly seen in their proposals. This was due to their extensive involvement in PFI projects in UK. Thus, lessons learn were clearly demonstrated in their proposals.

- **Life cycle maintenance**: Proposals provided by MPFI clearly showed the life cycle maintenance approach followed on KCS. It clearly stated how the life cycle maintenance would be carried out with minimal disruption to the delivery of education or extracurricular activities. It also demonstrated that the life cycle asset replacement strategy was based on selection of appropriate design components to support the life cycle maintenance as stated in the project agreement, i.e. ensuring that the quality of building would not deteriorate throughout the life of the project thereby mitigating appropriate life cycle risk.
In summary KCS development included following economic sustainability criteria as tabulated below in table 5.21.

**Table 5.20: Economic design criteria of KCS**

<table>
<thead>
<tr>
<th>Economic Sustainability</th>
<th>Main criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design to demonstrate innovation in flexibility (school to expand up to 33% gross floor area) and is capable of absorbing reasonable change in future without excessive disruption to the school.</td>
</tr>
<tr>
<td></td>
<td>Whole life cycle approach.</td>
</tr>
<tr>
<td></td>
<td>Life cycle maintenance</td>
</tr>
<tr>
<td></td>
<td>Carry out life cycle maintenance by minimising disruption to delivery of education or extracurricular activities.</td>
</tr>
<tr>
<td></td>
<td>Demonstrate life cycle asset replacement strategy.</td>
</tr>
<tr>
<td></td>
<td>Demonstrate how building design and component selection has supported the life cycle maintenance of the project agreement.</td>
</tr>
<tr>
<td></td>
<td>Ensure the quality of building would not deteriorate throughout the life of the project.</td>
</tr>
<tr>
<td></td>
<td>Mitigate life cycle risk</td>
</tr>
</tbody>
</table>
CASE STUDY PROJECT 3: SUSTAINABILITY ASSESSMENT
(Value for Money, Risk Transfer & Innovation)

Figure 5.14: Sustainability Assessment of KCS – Part 1
5.2.6.2 Sustainability assessment Part II: Relationship between VfM, RT and Innovation

In this section the study sets out to explore the relationship between the three main components of PPP projects mainly VfM, RT and Innovation. The respondents of this PPP project were asked to distribute a weighting of 100 between the three factors at different stages of the project life cycle in relation to three-pillar sustainability requirements. The graphical representation of the relationship between VfM, RT and Innovation are plotted between the weightings against PPP project lifecycle and shown in figures 5.15, 5.16 and 5.17.

a) VfM

This subsection will assess how the design of this project demonstrated the incorporation of VfM in relation to the three-pillar sustainability model: social, environmental and economic sustainability throughout the entire PPP procurement stages.

• Social Sustainability: The implementation of social sustainability measures was based on the requirements laid down by the authority and the performance requirements outlined in the output specification. The relationship developed during the negotiation phase is based on the authority requirements. The discussions and negotiations to provide the authority with best value due to long-term commitment is based on the expertise of the public sector. In case of KCS the respondents agreed that all the social requirements noted in the documents were met.

• Environmental Sustainability: The implementation of environmental sustainability is primarily based on the authority’s requirements and on prevailing legislation in relation to environmental requirements. As the risk is being transferred to the private sector, it must implement environmental sustainability measures that are legislative
or form part of the regulations. The planning process also imposes conditions in relation to these requirements. In case of KCS the respondents agreed that all the environmental requirements noted in the documents were met. However, VfM in relation to implementing environmental sustainability is in the interest of private sector.

- *Economic Sustainability*: This concerns the cost associated with the whole life cycle of the project and how the design proposed can mitigate or ease the maintenance of the building over its entire life time. The respondents agreed that all the economical requirements noted in the documents were met.

All respondents collectively acknowledged that design sustainability demonstrated VfM. However, the public sector still had reservations in relation to VfM as the projects are still in operational stage. Furthermore, it is argued by the authority that the VfM had been achieved in accordance with the Department of Finance VfM testing which still remains theoretical. In case of the private sector, VfM is demonstrated by achieving and meeting the performance criteria set out by the authority. However, the private sector has the VfM certainty through the contract document which sets out clear evaluation criteria in form of payment mechanism, performance-based output specification and whole life cycle cost to future proof the assets.

**b) RT**

RT is an important aspect of PPP procurement. The principal driver of proposed VfM under PPP is that the model allows for a level of RT that is not possible under traditional procurement methods (Reeves, E. 2013). Transferring the appropriate level of risk provides the incentive to increase returns by reducing costs and increasing efficiencies (Reeves, E. 2013). Thus, this model got the most publicity due to its RT matrix which states that the party best able to manage the risk should bear the risk.
• **Social Sustainability**: The design implementation of social sustainability of KCS project was the response provided by the private partners to the output specification provided by the authority. This depended on the its expertise and know-how in securing the best deal for this project based on the discussions and negotiations carried out during this process. However, the essence of this procurement process was to transfer all design risk to the private partners.

• **Environmental Sustainability**: The implementation of environmental sustainability measures was primarily based on legislative requirements. As the risk being transferred to the private sector it was in the interest of private sector to implement environmental sustainability measures that are legislative or form part of the regulations. The planning process also imposed conditions in relation to these requirements. Thus, RT in relation to implementing environmental sustainability was in the interest of private sector.

• **Economic Sustainability**: This concerns the cost associated with the whole life cycle of the project. The risks associated with operation of the assets remains with the private sector thus it was in the interest of private sector to mitigate any issues arising in relation to this criterion.

The RT assessment process within the PPP procurement was agreed by all parties as being the most robust. The significance of ensuring the risks are allocated to the party best able to manage them was stressed by the authority. Furthermore, lessons learned from previous PPP projects provided an insight that helped in clearly identifying the project risks. A clear risk identification was carried out at risk workshops and documented in the risk register and formed part of the contract. All the respondents agreed that design risk was transferred to the private sector; however, there are areas still grey and not clearly defined.
For example, the utilities bill is been directly paid by the authority which leaves certain design risks not fully transferred to the private sector.

c) Innovation

Innovation is one of the main reasons for adopting the PPP route. The private sector expertise in relation to innovation is one of the important aspects of PPP procurement. This subsection will assess the innovation implemented on PPPs in relation to sustainability aspects.

- **Social Sustainability**: Innovation in social sustainability was based on design provided by the private sector to authority’s requirements, as laid out in the output specification. It also relied on authority’s expertise in achieving the best for the project which manifested by the relationship developed between the two partners. However, all respondents of this project agreed that design innovation was of cost saving nature.

- **Environmental Sustainability**: The implementation of innovation in environmental sustainability measures were primarily based on cost saving innovation. Thus, innovations in relation to environmental sustainability were based on operational cost savings to the private sector and compliance with the relevant legislation.

- **Economic Sustainability**: This concerns the cost associated with the whole life cycle of the project. The risks associated with operation of the assets remains with the private sector thus it is in the interest of private sector to mitigate any issues arising in relation to this criterion with innovative methods.

Innovation within the PPP procurement model was agreed by all parties as being the least important and was only implemented if it had benefit to the private sector. Refer to figures 5.15, 5.16 and 5.17 which gives graphical representation of the relationship between VfM, RT and Innovation in relation to social, environmental and economic sustainability parameters.
Case study project 3: Social Sustainability: Relationship between VfM, RT, and Innovation

Figure 5.15: KCS Social Sustainability Assessment – Part 2

PPP Project Life cycle
Case study project 3: Environmental Sustainability: Relationship between VfM - RT - Innovation

**Figure 5.16: KCS Environmental Sustainability Assessment – Part 2**
Case study project 3: Economic Sustainability : Relationship between VfM-RT- Innovation

Figure 5.17: KCS Economic Sustainability Assessment – Part 2
5.2.6.3 Drivers and Barriers

The drivers and barriers on the KCS PPP project are identified and presented in Table 5.22. The key drivers and barriers that have had a significant impact on the project during the course of the procurement lifecycle have been documented. In some instances, there has been an overlap between the drivers and barriers as they play dual roles. The distinction between them is dependent on the context in which they are viewed as well as the content that they represent.

**Table 5.21: Key drivers and barriers of KCS**

<table>
<thead>
<tr>
<th>Public sector</th>
<th>PPP Evaluation Technical/Legal/Financial</th>
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<tbody>
<tr>
<td><strong>Drivers</strong></td>
<td>• Political</td>
</tr>
<tr>
<td></td>
<td>• Social</td>
</tr>
<tr>
<td></td>
<td>• Economy</td>
</tr>
<tr>
<td></td>
<td>• Legal</td>
</tr>
<tr>
<td></td>
<td>• Technology</td>
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<tr>
<td></td>
<td>• Environmental</td>
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<td></td>
<td>• Relationship established by partnership</td>
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<td>• Value for money</td>
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<td>• Risk transfer</td>
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<td></td>
<td>• Innovation</td>
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<td></td>
<td>• Affordability</td>
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<td></td>
<td>• Past experience</td>
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<td></td>
<td>• Government Commitment</td>
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<td></td>
<td>• Cost certainty</td>
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<td>• Life cycle maintenance</td>
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<td><strong>Barriers</strong></td>
<td>• Global recession</td>
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<td>• Lack of Policy</td>
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<td></td>
<td>• Affordability requirements</td>
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<td>• Resource available</td>
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<td></td>
<td>• Detailed Output specification</td>
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<td>• Lengthy Contract documents</td>
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<tr>
<td></td>
<td>• Lengthy pre-procurement process</td>
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<tr>
<td></td>
<td>• Site conditions</td>
</tr>
<tr>
<td></td>
<td>• Mind set</td>
</tr>
<tr>
<td></td>
<td>• Public perception</td>
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<tr>
<td></td>
<td>• Risk transfer</td>
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<td>• Economy</td>
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<td>• Uncertainties</td>
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<td></td>
<td>• Obsolescence</td>
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<td></td>
<td>• Trade-offs</td>
</tr>
</tbody>
</table>
5.2.6.4 Conclusion

Based on the documentation review, interview sessions and data analysis, the following conclusion are made:

Sustainability inclusion in relation to VfM, RT & Innovation on KCS project focused primarily around complying with the requirements laid out in the contract document. The design requirements of the project were based around the concept of ‘cradle to grave’. How these manifested themselves in relation to these three attributes was based on the relationship formed at process level, individual level, organisational level, and the partnership in its totality.

Thus, in conclusion the KCS project showed greater inclination in relation to sustainability towards VfM and RT as compared to Innovation. Thus, this project clearly showed that these three attributes are co-dependent, and the project as implemented is a viable project.

5.2.7 Case Study Project 4: Athboy Community School, Meath (ACS):

In SB2 project there are 5 post-primary schools and 1 primary school on 5 locations. ACS is the fourth case study project to be studied in detail in SB2 which is implemented by the PPP route. Refer to appendix 6 for school site plan and as built aerial view.

5.2.7.1. Sustainability assessment Part 1:

In this section an assessment in relation to social, environmental and economic sustainability as implemented on this school will be carried out based on document review and semi structured interviews. A weighting of 1 to 7 was given by the respondents in relation to the three parameters of VfM, RT and Innovation as implemented in relation to design of social, environmental and economic sustainability of this school building. The
The final outcome of the assessment is graphically presented on the spider diagram in figure 5.18.

**a) Social Sustainability assessment:**

The ACS school site was a greenfield site located off Lower Bridge Street, Kells Road in the townland of Fosterfields, Athboy and County Meath. The site was 3.665 hectares and was located behind an existing V.E.C. school with access passing beside this school. The site was surrounded partly by modern two and single storey housing to the east, a protected structure to the west and St James Vocational School to the south. The site was irregular shape and some of the site was also surrounded by agricultural land. This school was formed by amalgamating St. James Vocational School and St Joseph’s Secondary School from Athboy and is functioning as Athboy Community School. The new school caters for 950 pupils and associated staff. The following social sustainability parameters were followed in this school.

In summary the new school included following social sustainability criteria which are tabulated below in table 5.22:
Table 5.22: Social design criteria of ACS

<table>
<thead>
<tr>
<th>Social Sustainability</th>
<th>Main criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design to improve educational standards:</strong> The proposed school was a two-storey building with pitched roofs. The design was based on a central spine which acts as the heart of the school and facilitates orientation along the entire school building. The Special Needs Unit was located at the end of the south wing with its own garden and direct external as well as internal access.</td>
<td></td>
</tr>
<tr>
<td><strong>Uniqueness and quality of proposals that add value beyond just meeting basic accommodation needs:</strong> The main entrance led to a double volume GP area which formed a series of interconnected spaces on an east-west axis, comprising of teaching space. The circulation routes ran along either side of this spine with the various functions arranged over two stories on the other side. The P.E. hall extends directly north off the G. P. Area creating the possibility of functionally interlinking these spaces. The courtyard could be used as an additional audience space from the Music-Drama Room and a possible outdoor teaching space.</td>
<td></td>
</tr>
<tr>
<td><strong>Local setting and community context:</strong> The school was located off the main road. Due to the size and location of site, it was not visible from the main road, however the location was quite central in context to Athboy town and was in designated area for educational facilities.</td>
<td></td>
</tr>
<tr>
<td><strong>Entrances:</strong> Access to the new school was from the west end of the existing VEC School. The access road to the main entrance was by a circuitous route which was determined by the shape of the school site.</td>
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<tr>
<td><strong>Access for all:</strong> The entire school buildings was universally accessible</td>
<td></td>
</tr>
<tr>
<td><strong>Way finding &amp; signage:</strong> This school design provided clear way-finding and access strategy to enable good circulation</td>
<td></td>
</tr>
<tr>
<td><strong>Sun paths &amp; views:</strong> The school had views from inside the teaching &amp; learning areas</td>
<td></td>
</tr>
<tr>
<td><strong>Acoustics:</strong> The school was designed to good acoustic standards for both students and the teaching staff</td>
<td></td>
</tr>
<tr>
<td><strong>Safety and security:</strong> The school design provided increased safety of pupils and staff due to a clear traffic management strategy</td>
<td></td>
</tr>
</tbody>
</table>
b) Environmental Sustainability assessment

This section will identify the various environmental sustainability criteria as implemented on ACS and will verify how the requirements of output specification influenced the design of the existing school. Along with the authority requirements, the Meath County Council also implemented conditions in relation to protection of environment mainly waste management and environment pollution caused due to construction activity. The ACS main focus was on environmental and energy design strategy and environmental assessment. These will now be explained in further detail.

i) Environmental Services Strategy

- **Natural Ventilation:** Simulations were carried out at design stage to demonstrate compliance with building Regulations Part L satisfactorily.
- **Air Quality:** Simulations to analyse the levels of CO2 were carried out at design stage in compliance with levels recommended by CIBSE.
- **Natural Daylight:** Detailed daylight simulations were carried out which demonstrated compliance with the authority’s requirements.
- **Solar Gain:** Simulations were carried out to check the room temperature and demonstrate compliance with building regulations part L.
- **Control Strategies:** A building energy managements system was put in place which helps to reduce energy consumption and CO2 emissions, improve comfort and allow ease of control, operation and monitoring.
- **Short-term flexibility / Longer Term adaptability:** Additional space was allowed for future expansion of plant. Spare capacity was incorporated into cable containment systems. Additional CCTV camera points were wired to strategic locations around the building, to allow the future expansion of the CCTV system by simply adding new cameras which exceeded the authority’s requirements.
ii) Energy Strategy

The preferred bidder at design stage submitted a detailed report to the authority, describing the energy and environmental strategies that matched and, in some cases, exceeded the authority’s requirements as listed below.

- **Consumption:** The Tenderer demonstrated at design stage that ACS will achieve an A3 building energy rating and the design measures were included to provide a highly insulated and well-sealed building envelope, a high-performance glazing system, natural ventilation, maximum use of natural daylight and concrete thermal mass used as heat sink etc.

- **Sources:** The school was supplied with electricity from the National Grid (to be supplemented as detailed below) and natural gas (where available) or oil. The school would also generate electricity using photovoltaic panels to contribute to 4.5% of the annual electrical demand.

- **Energy Usage & Cost:** The following energy saving measures were proposed:
  - Lighting control, energy efficient lamps and LED fittings to external lights
  - Variable speed control to extract fans
  - Air tight construction with an air permeability of 3 m³/m²/hr at 50Pa
  - Rainwater harvesting

- **Energy Management:** A BMS was proposed for all schools. Additional sub metering was also provided to monitor energy use. At design stage seasonal commissioning was proposed during the first year of occupancy to ensure correct control of systems

iii) Environmental Assessment

At design stage MPFI presented a very detailed, in-depth high-quality report describing all the elements of the proposed facilities environmental characteristics in
relation to the authority’s requirements. The proposal met with the authority’s requirements and exceeded them in some cases as outlined below.

- **Sustainable Approach:** The use of the BREEAM to demonstrate the impact of building on environment. The BREEAM achieved 30% more credits compared with the authority requirements as set out in the project agreement. At design stage MPFI used the NEAP to determine that ACS will perform on average 15% better than the heating benchmark and 25% better than the electrical benchmark (excluding equipment load). Including the equipment load the schools would perform approx. 6% better than the electrical benchmark.

- **Approach to Sustainable Management:** MPFI highlighted that the following would be carried out on ACS:
  - Seasonal commissioning to ensure optimum efficiency
  - CO2/Energy arising from site activities would be monitored
  - Water consumption from site activities would be monitored
  - Best Practice polices with respect to air and water pollution would be adopted
  - Source timber from sustainable managed sources

- **Compliance with Part L:** At design stage MPFI used the NEAP to compare the schools against the reference building and increase the overall building U-value by 50%. This exceeded the requirements of Part L. The ACS showed a design carbon performance coefficient of 0.53, which was a 47% improvement on the maximum permitted energy performance coefficient of 1.0 allowed under building regulations.

- **Environmental Statement:** At design stage MPFI carried out a preliminary environmental statement which looked at the impact of this development on Flora and Fauna, Soil and Water.
- **Proposed Green features on ACS:** At design stage MPFI proposed water consumption 50% better than DoES benchmark by including rain water harvesting system, air pollution would be reduced by the selection of low NOx emission boilers, providing Air Tightness of 3 m³/m²/hr at 50Pa., achieving an A3 Building Energy Rating taking measures of reducing energy consumption by providing LED lighting and use of photovoltaics to contribute to 4.5% of the annual electrical demand, using A rated building materials and minimising construction waste that exceeds the authority’s requirements:

In summary this school design included following environmental sustainability criteria as tabulated below in table 5.23:
Table 5.2: Environmental design criteria of ACS

<table>
<thead>
<tr>
<th>Environmental Sustainability</th>
<th>Main criteria</th>
<th>Sub-criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Environmental design</td>
<td>• Natural ventilation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Air Quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Natural daylight</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Solar gain</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Control for heating and lighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Short-term flexibility/ Longer term adaptability</td>
</tr>
<tr>
<td></td>
<td>Energy design</td>
<td>• Target electricity consumption to be achieved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• A3 building energy rating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Target gas consumption to be achieved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Target oil consumption to be achieved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Air tightness of m³/m²/hr at 50Pa</td>
</tr>
<tr>
<td></td>
<td>Environmental assessment</td>
<td>• Use of BREEAM assessment tool.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Environmental impact assessment of existing site,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Conditions in planning,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Environmental impact during construction and demolition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Traffic impact assessment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Co2 emissions due to site activities will be monitored and reported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Co2 emissions due to transport to and from site will be monitored.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Air pollution reduced by using low NOx emission boilers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Insulation used in the development to be zero ozone potential and will have a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>global warming potential of less than 5.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Materials used for construction (timber) procured from renewable sources and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>use of A rated construction materials.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Target water consumption 50 % better than DoES benchmark.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use of Photovoltaic to contribute electrical demand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rain water harvesting.</td>
</tr>
</tbody>
</table>
c) Economic Sustainability Assessment

The first main design assessment criteria under economic sustainability is the flexibility of expansion without excessive disruption to the school, secondly whole life cycle approach and thirdly the life cycle maintenance. These are explained in detail below.

- **Design to demonstrate innovation in flexibility**: As per DoES TGD, all school buildings should be flexible to take expansion of 33% GFA and is capable of absorbing reasonable future change without excessive disruption to the school. The proposals submitted by MPFI showed that PCD was compliant with the DoES TGD requirements at KCS.

- **Whole life cycle approach**: MPFI continually involved Sodexo, their main O&M and life cycle maintenance subcontractor in ACS design development stages. Thus, their designs reflected clear understanding of design which had ease of O&M and life cycle maintenance approach. MPFIs approach towards using robust materials which will ease the operation cost was clearly seen in their proposals. This was due to their extensive involvement in PFI projects in UK. Thus, lessons learn were clearly demonstrated in their proposals.

- **Life cycle maintenance**: Proposals provided by MPFI clearly showed that the life cycle maintenance approach would be followed on ACS project. It clearly stated how the life cycle maintenance would be carried out with minimal disruption to the delivery of education or extracurricular activities. It also demonstrated that the life cycle asset replacement strategy would be based on selection of appropriate design components to support the life cycle maintenance as stated in the project agreement along with ensuring the quality of building does not deteriorate throughout the life of the project along with mitigating appropriate life cycle risk.
In summary this development included following economic sustainability criteria as tabulated below in table 5.24.

**Table 5.24: Economic design criteria of ACS**

<table>
<thead>
<tr>
<th>Economic Sustainability</th>
<th>Main criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Design to demonstrate innovation in flexibility (school to expand up to 33% gross floor area) and to be capable of absorbing reasonable change in future without excessive disruption to the school.</td>
</tr>
<tr>
<td></td>
<td>• Whole life cycle approach.</td>
</tr>
<tr>
<td></td>
<td>• Life cycle maintenance</td>
</tr>
<tr>
<td></td>
<td>➢ Carry out life cycle maintenance by minimising disruption to delivery of education or extracurricular activities.</td>
</tr>
<tr>
<td></td>
<td>➢ Demonstrate life cycle asset replacement strategy.</td>
</tr>
<tr>
<td></td>
<td>➢ Demonstrate how building design and component selection has supported the life cycle maintenance of the project agreement.</td>
</tr>
<tr>
<td></td>
<td>➢ Ensure the quality of building does not deteriorate throughout the life of the project.</td>
</tr>
<tr>
<td></td>
<td>➢ Assess and manage life cycle risk</td>
</tr>
</tbody>
</table>
CASE STUDY PROJECT 4: SUSTAINABILITY ASSESSMENT
(Value for Money, Risk Transfer & Innovation)

Figure 5.18: Sustainability Assessment of ACS – Part 1
5.2.7.2 Sustainability assessment Part II: Relationship between VfM-RT-Innovation

In this section the study sets out to explore the relationship between the three main components of PPP projects mainly VfM, RT and Innovation. The respondents of ACS PPP project were asked to distribute a weighting of 100 between the three factors at different stages of the project life cycle in relation to three-pillar sustainability requirements. The graphical representation of the relationship between VfM, RT, and Innovation are plotted between the weightings against PPP project lifecycle and shown in figures 5.19, 5.20 and 5.21.

a) VfM

The main driver of ACS school design was incorporation of VfM on all aspects of design consideration to ease construction and maintenance of the asset over its life span. This subsection will assess how the design incorporates VfM in relation to the three-pillar sustainability model: social, environmental and economic sustainability requirements throughout the entire PPP procurement stages.

• Social Sustainability: Design in relation to social sustainability was based on authority’s performance requirements as outlined in the output specification. The highlight in relation to social design incorporation of this school project was interconnection between social spaces and the courtyard to enhance the social as well as educational environment. However, the end product was dependent on the expertise and know-how of the authority in securing the best value and design for the project due to long-term commitment.

• Environmental Sustainability: As the risk is being transferred to the private sector it is in the interest of private sector to implement environmental sustainability which are
legislative or form part of the regulations. The planning process also implements conditions in relation to these requirements. The main highlight of this project was the use of environmentally friendly materials along with the source of green energy by the provision of photovoltaic. However, VfM in relation to implementing environmental sustainability is in the interest of private sector.

- **Economic Sustainability**: This concerns the cost associated with the whole life cycle of the project and how the design proposed can simplify the maintenance of the building over its entire life time. The main economic benefit was the use of low maintenance building materials along with provision of photovoltaic to offset energy consumption by green source and water conservation by rain water harvesting.

All respondents collectively acknowledged that design sustainability demonstrates VfM. However, the public sector still has reservations in relation to VfM as the projects are still in operational stage. Furthermore, it is argued by the authority that the VfM has been carried out in accordance with the Department of Finance VfM testing. This still remains theoretical. In case of private sector, VfM is in demonstrating the performance criteria set out by the authority have been met. However, the private sector has the VfM certainty through the contract document which sets out clear evaluation criteria in form of payment mechanism, performance-based output specification and whole life cycle cost to future proof the assets.

b) **RT**

The ACS PPP model transfer all risk apart from the demand risk to the PPP co.

- **Social Sustainability**: On the ACS project the private partners based their social design inclusions on the information provided in output specification. This design proposal further gets developed based on the expertise of the authority to secure the
best design option from the private partners that provides value over the long-term commitment of the project. On this project, all risks associated with design were transferred to the private sector.

- **Environmental Sustainability**: The implementation of environmental sustainability is primarily based on legislative requirements. As the risk is being transferred to the private sector it is in the interest of private sector to implement environmental sustainability which are legislative or form part of the regulations. The planning process also implements conditions in relation to these requirements. Thus, RT in relation to implementing environmental sustainability is in the interest of private sector.

- **Economic Sustainability**: This deals with the cost associated with the whole life cycle of the project. The risks associated with operation of the assets remains with the private sector thus it is in the interest of private sector to mitigate any issues arising in relation to this criterion.

All design risk associated with the three-pillar sustainability model of ACS project was the responsibility of the private partners. All respondents agreed that the project had very clear RT in relation to design of the project. Furthermore, the learning curve by the authority from previous PPP projects has provided an insight to clearly specify their project objectives in the project brief. The mechanisms within the contract are seen as the main tool to ensure that RT assessment process is in place. A clear indication as to who is responsible for the specified risks is being carried out at risk workshops and identified in the documents. The risk register which is a part of the contract and again it is through the contract that this characteristic is attained.
c) Innovation

Private sector expertise in relation to innovation is one of the drivers of PPP model. This subsection outlines the design innovation as implemented on ACS PPP project in relation to three-pillar sustainability model.

- **Social Sustainability**: Innovation in the provision of social sustainability of this project was primarily derived from the output specification. The authority then negotiates with the private partner to get the best proposal based on various communications and discussions and secures the best possible solution for the project. The highlight of this project in relation to social innovation in design was achieved by interlinking and opening social spaces to form one big space.

- **Environmental Sustainability**: The implementation of environmental sustainability is primarily based on legislative requirements. As the risk is being transferred to the private sector it is in the interest of private sector to implement innovative environmental sustainability. The highlight of this project was the use of green energy, rain water harvesting to minimise water consumption. The innovation was focused mainly around cost saving throughout the life cycle of the project and in line with the authority requirements of the project agreement.

- **Economic Sustainability**: This concern the cost associated with the whole life cycle of the project. The innovation in relation to economic sustainability was limited and was mainly revolving around complying with the authority requirements.

5.2.7.3 Drivers and Barriers

The drivers and barriers with regards to the ACS PPP project have been identified and presented in Table 5.25. The key drivers and barriers are tabulated as they have had a significant impact on the project during the course of the procurement lifecycle. In some
instances, there has been an overlap between the drivers and barriers as they play dual roles. The distinction between them is dependent on the context in which they are viewed as well as the content that they represent.

**Table 5.25: Key drivers & barriers of ACS**

<table>
<thead>
<tr>
<th>Public sector</th>
<th>PPP Evaluation Technical/Legal/Financial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivers</td>
<td>Similar drivers as KCS, this is due to projects been bundled to make economic viability for PPP implementation.</td>
</tr>
<tr>
<td>Barriers</td>
<td>Similar Barriers as KCS</td>
</tr>
</tbody>
</table>

5.2.7.4 Conclusion

Based on the documentation review, interview sessions and data analysis, the following conclusion are made:

Sustainability inclusion in relation to VfM, RT & Innovation on ACS project has focused primarily around complying with the requirements laid in the contract document. The design requirements of the project were based around the concept of ‘cradle to grave’. How these transpired in relation to the three attributes was based on the relationship formed at process level; individual level; organisational level; and the partnership in its totality.

The graphical representation of the three parameters in relation to social, environmental and economic sustainability is represented in the figures 5.19, 5.20 and 5.21.

Thus, in conclusion the ACS project showed greater inclination in relation to sustainability towards VfM and RT as compared to Innovation. Thus, this project clearly showed that these three attributes are co-dependent and the project as implemented is a viable project.
Case study 4 Social Sustainability: Relationship VfM - RT - Innovation

Figure 5.19: ACS Social Sustainability Assessment – Part 2
Case study project 4: Environmental Sustainability: Relationship VfM – RT - Innovation

Figure 5.20: ACS Environmental Sustainability Assessment – Part 2
Case study project 4: Economic Sustainability: Relationship VfM - RT - Innovation

Figure 5.21: ACS Economic Sustainability Assessment – Part 2
5.3 Summary

This chapter has presented analysis of four case studies of PPP projects used in this research. The case studies were all PPP projects in the education sector. Issues and challenges in conducting these case studies were also highlighted. The analysis put forth was primarily based on documentation reviews and semi-structured interviews. Participant observation contributed an important aspect to the overall analysis of each case. The research propositions were addressed in the conclusion section of each case study to capture the essence of the individual projects. Based on these propositions, a cross-case analysis is presented in the next section.

5.4 Cross Case Analysis

This section integrates the findings of the four case study projects documented comprehensively in Section 5.4.2 through a cross case analysis. Yin, R. (2009) states that multi-case analysis strengthens the results. Yin, R. (2009) also stresses that cross case analysis is based on subjective interpretation and not arithmetic accumulation. Stake, R.E. (2006) states that multiple case studies with similarities have an element of complexity. Thus, in a multiple case study the uniqueness of each case is more important than the similarities.

5.4.1 Cross Case Analysis Structure

The main outcome of undertaking multiple case studies is logic of replication. This further branches out into literal or theoretical replication. Thus, based on the cross-case analysis the logic of replication is identified through the findings. The analysis will focus on the core factors raised in the literature review as identified in Chapters 1, 2 and 3 and will relate similarities and uniqueness of the findings of the case studies.
5.4.2 SB1 Case Study Project 1 - GCSF vs SB2 Case Study Project 3 - ACS

The cross-case analysis was carried out between SB1 and SB2 projects. One project from each bundle was selected for this analysis. Case studies 1 and 4 are both PPP projects implemented by DoES. Both are educational projects and were part of School PPP Programme launched by the Minister of Education & Skills. These two projects are located in Offaly County Council and Meath County Council respectively. These two projects are compared and assessed based on VfM, RT & Innovation in relation to three-pillar sustainability model.

![Diagram of Cross Case Analysis]

\textbf{Figure 5.22: Structure for Cross case analysis}

\textbf{a) Value for Money (VfM)}

The analysis carried out in relation to the two case study projects GCSF & ACS and how they demonstrated VfM in their proposed school designs was reviewed based on project documents and interviews carried out.

The VfM comparisons of these two projects were based on the Public Sector Benchmark (PSB) as developed for the two schools. Both schools were within the PSB, thus from the
authority perspective demonstrated VfM. We will now assess the two projects based on social, environmental and economic sustainability parameters.

**Social Sustainability:** The two projects demonstrated the social requirements as stated in the project agreement and complied with the social design requirements as laid out in the project documents.

**Environmental Sustainability:** VfM assessment of the two projects in relation to environmental sustainability was based on the design environmental requirements as laid down in the project agreement. It also incorporated the legal, legislative and building regulations compliance requirements in terms of protecting the environment and mitigating the effects of the construction activity on the environment. The VfM was demonstrated by how well the risk was transferred in relation to the environmental requirements of the projects to the private partners along with design Innovation it could bring to the project.

**Economic Sustainability:** In the two projects VfM in relation to economic sustainability was primarily based on the PSB. The viability of the project was based on whether the project was within the envelop of the project cost as developed by the PSB. Both the projects were within the calculated PSB for the respective project.

**b) Risk Transfer (RT)**

**Social Sustainability:** In case of these two projects all risks in relation to design were transferred to the private sector and was quantified and included in the PSB.

**Environmental Sustainability:** All risks associated with environmental design and construction and operation were based on the authority requirements and any requirements which were not included were still the responsibility of the private sector.
Economic Sustainability: All risks associated with economic sustainability in relation to design were based on the requirements of the authority. However, all design risks were transferred to the private sector.

e) Innovation

Social sustainability: Design of the two projects was based on the authority requirements and thus Innovation delivered in the designs reflected these requirements. The two projects assessed showed limited design Innovation. The social requirements were met to authority requirements but were limited in terms of Innovation.

Environmental sustainability: The design risks relating to environmental performance of the building was based on the authority requirements as stated in the project agreement. Innovation in environmental sustainability was seen to a greater extent on the SB2 project compared to the SB1 project.

Economic sustainability: The design risks were transferred to the private sector and thus economies in design were seen in the design of these schools. Moreover, it was more explicit on SB2 projects than on SB1.

5.4.3 Relationship and Co-dependency between VfM, RT and Innovation in the context of achieving sustainability from the Authority perspective

The sustainability assessment was carried out on the four school projects under the two bundles of PPP, SB1 and SB2 to identify extend of sustainability inclusion on these projects based on the three-pillar model throughout the PPP procurement stages. The respondents assessed the extent of sustainability followed on the various stages of PPP project lifecycle from an authority perspective. It was also noted that the response from the respondents was influenced by their involvement in the project.
Based on the three-pillar sustainability model following inferences are made:

i. The three-pillar sustainability model is affected by the three key processes of the PPP procurement which are Innovation, RT and VfM.

ii. These processes are the main drivers of sustainability in a PPP environment.

iii. These processes are co-dependent throughout the lifecycle of the project.

iv. In theory a perfect equilateral triangle will demonstrate achieving total sustainability of a project in relation to the three-pillar model.

The relationship between VfM, RT and Innovation is determined based on the co-dependency identified within the respective PPP projects. Both case studies concur that an integrated relationship exists between these processes. These processes were viewed by some of the respondents as procedural requirements of the PPP procurement. Moreover, these three processes are dynamic in nature when related to a PPP project over its entire lifecycle. Figure 5.23 shows the analysis of these three processes in relation to the authority perspective on the two cross case study projects.
Figure 5.23: Sustainability Assessment from Authority Perspective
5.4.4 Sustainability: Drivers and Barriers

The drivers and barriers are unique to the individual projects and have been identified in the respective case studies, as presented previously in Tables 5.9 and 5.26. A comparison between the two case studies to identify key drivers and barriers was performed. The criteria used to determine the key factor was based on the representation of a factor by more than one party within the partnerships. The results are tabulated in Table 5.26.

**Table 5.26: Comparison between drivers and barriers of GCSF & ACS**

<table>
<thead>
<tr>
<th>Public sector</th>
<th>PPP Evaluation Technical/Legal/Financial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivers</td>
<td>• Political</td>
</tr>
<tr>
<td></td>
<td>• Social</td>
</tr>
<tr>
<td></td>
<td>• Economy</td>
</tr>
<tr>
<td></td>
<td>• Legal</td>
</tr>
<tr>
<td></td>
<td>• Technology</td>
</tr>
<tr>
<td></td>
<td>• Environmental</td>
</tr>
<tr>
<td></td>
<td>• Relationship established by partnership</td>
</tr>
<tr>
<td></td>
<td>• Value for money</td>
</tr>
<tr>
<td></td>
<td>• Risk transfer</td>
</tr>
<tr>
<td></td>
<td>• Innovation</td>
</tr>
<tr>
<td></td>
<td>• Affordability</td>
</tr>
<tr>
<td></td>
<td>• Past experience</td>
</tr>
<tr>
<td></td>
<td>• Government Commitment</td>
</tr>
<tr>
<td></td>
<td>• Cost certainty</td>
</tr>
<tr>
<td></td>
<td>• Life cycle maintenance</td>
</tr>
<tr>
<td>Barriers</td>
<td>• Global recession</td>
</tr>
<tr>
<td></td>
<td>• Lack of Policy</td>
</tr>
<tr>
<td></td>
<td>• Affordability requirements</td>
</tr>
<tr>
<td></td>
<td>• Resource available</td>
</tr>
<tr>
<td></td>
<td>• Information contained in output</td>
</tr>
<tr>
<td></td>
<td>specication</td>
</tr>
<tr>
<td></td>
<td>• Lengthy Contract documents</td>
</tr>
<tr>
<td></td>
<td>• Lengthy pre-procurement process</td>
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<td></td>
<td>• Site conditions</td>
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<tr>
<td></td>
<td>• Mind set</td>
</tr>
<tr>
<td></td>
<td>• Public perception</td>
</tr>
<tr>
<td></td>
<td>• Risk transfer</td>
</tr>
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<td></td>
<td>• Economy</td>
</tr>
<tr>
<td></td>
<td>• Uncertainties</td>
</tr>
<tr>
<td></td>
<td>• Obsolescence</td>
</tr>
<tr>
<td></td>
<td>• Trade-offs</td>
</tr>
</tbody>
</table>
5.4.5 **Conclusion: Sustainability Model**

Respondent views in relation to sustainability of the design projects were taken in relation to both the projects. The views of respondents in relation to GCSF & ACS were mixed. The private sectors opinion was the ACS was more sustainable in relation to design than the GCSF. This was mainly due to the ratio of quality to cost. In SB2 projects the quality: cost ratio was 70:30 were as in SB1 it was 60:40. The respondent also mentioned that if quality is given more weighting, it brings out innovation in design. However, 80% respondents agreed that the requirements as laid out in the output specification were very prescriptive and to a greater extent hinder creative innovation. 50% of respondents agreed that the projects implemented showed greater inclusion of environmental and economic sustainability as compared to social sustainability requirements. Thus, on a three-pillar sustainability model they are classified as viable projects (Sustainability Venn diagram). It was also believed that the competitive dialogue procedure followed on SB2 helped with the development of the design. Moreover, it is also perceived by the private partners, that the PPP procurement process is sustainable with the support of government and financial markets. Thus, political will, along with appropriate allocation of finance, can be a greater contributor of sustainability. PPPs are considered to be more expensive when compared with traditional projects as the PSB still remains theoretical. Research also shows that they can be more time consuming during the pre-procurement stages due to lengthy procedures, however, once the project is on site the programme showed remarkable benefits compared to the traditional projects. PPP projects are more complex in terms of engagement and are more technologically advanced in implementation compared to traditional projects. Due to national fiscal constrains PPP was viewed as the only means of securing certain projects at this time. Thus, the PPP project is affected by endogenous as well as exogenous factors.
CHAPTER: 6
ANALYSIS OF CASE STUDIES FINDINGS

6.0 Introduction
The previous chapter showed that sustainability project outcome differences are affected by the three main factors, Innovation, RT and VfM in a PPP project environment. Thus, these are identified as the CSFs in implementing sustainability on PPP school projects. This chapter will present the findings of chapter 5 including the respective case study projects and cross-case analysis of these case study projects. The case study findings were referred to the respondents for feedback which served as a validation process for the interpretations drawn. It also helps in the reliability of the findings as it would lead to data triangulation.

As indicated, the significance and co-dependency of implementing sustainability within a PPP school project environment needs to be determined. Hence the influence of sustainability within the core processes was explored throughout the case studies. This chapter will identify the characteristics seen on the case study bundle projects and show how they relate to the main CSFs from a public sector perspective.

6.1 Public Sector Perspective (Authority)
This section identifies the findings of the case studies from the public sector perspective. Splitting the project into two main stages, pre-procurement and post procurement, firstly identified the processes involved in finalising the contract documents that are the basis for the design of the PPP projects. This helped to identify the sustainability related criteria to be included in the documentation. Secondly, it identified how the design
helped in the facilities’ construction and operation. It also highlights the incorporation of sustainability criteria, specific to the design, construction and operation stages. This facilitates the analysis of the process from the public sector perspective, establishes the basis on which the preferred bidder was selected and clarifies the working of the project after the financial close, i.e. construction and operation stages. Thus, the two stages help in identifying the implementation of sustainability in relation to the three main factors of PPP school projects – Innovation, RT, and VfM.

6.1.1 Innovation

Innovation is seen as a value-adding process on PPP projects. It generates creative ideas at design stage (Oetinger, B. 2013; Birdi, K S. 2005), along with successful application of concept in terms of output or product (Cummings, T. G., & Worley, C. G. (2005). Non-standard and untried innovative processes could impact on the project’s constructability and ultimately impact on time and cost outcomes (Raisbeck, P. 2008). In a PPP project, initial design is the primary means of meeting client requirements as set in the project brief (Gruneberg et al. 2006). The output specifications and service level agreements enable private sector actors to be innovative and use their skill and experience to create solutions that best serve the client’s needs (e.g. Li, B & Akintoye, A. 2003). It is however claimed that in a PPP project environment, the private sector actors are given greater freedom to interpret tender documents, considered a positive aspect of PPP arrangement that can foster innovation.

Construction Industry Council (2000) gives guidance on innovation in the context of PPP/PFI projects and suggests that innovation can be classified as either product enhancing or cost saving. Product enhancing innovation deals with higher quality products for which the client is willing to pay a higher cost. Cost-saving innovation
deals with savings achieved by the project over its entire life-cycle, which typically includes quality improvements to the durability and reduce running cost. These have been reiterated further in relation to the case studies carried out as part of this research.

**Product enhancing innovation:** In a PPP project environment product enhancing innovation mainly depends on the requirements set by the sponsoring authority. It is driven by the Public Sector performance requirements set in the contracting document. Regarding the case study projects, product enhancing innovation was limited to the performance requirements as laid out in the contract documents.

**Cost-saving innovation:** In a PPP project environment cost-saving innovation has probably been implemented by the private sector as they envisage long term merit. It is in the interest of the private sector to use innovation to minimise the running and maintenance cost on a PPP project due to its long-term duration of the concession period. In case of the case study projects, cost-saving innovation was seen in integrating spaces to form social areas thereby enhancing the usability of spaces. In case of SB2 projects inclusion of renewable energy was introduced along with water conservation by implementing rain water harvesting systems. This was influenced by the policy decision by DoES.

On the four case study projects all designs showed cost-saving innovation whereas product enhancing innovation was limited by the public sector requirements as laid out in output specification and contract documents.

### 6.1.2 Risk Transfer

In a PPP project environment risk plays an important role, as it is transferred to the party best able to manage it (Fox, J and Tott, N. 1999). In a PPP project environment, RT and VfM are correlated with a strong relationship, identified by the case study
projects. However, critics of PPP projects argue that RT remains theoretical and is performed as a fulfilment of the VfM economic analysis (Ball, R et al. 2001; Froud, J & Shaoul, J 2001; Edwards, P & Shaoul, J. 2003a; Edwards, P. et al. 2004; Froud, J. 2003; Heald, D. 2003). The allocation of risk in a PPP project environment is crucial for the success of a project.

There are three main risk types:

**Retained risks:** Risks retained by the public partners or authority and are not transferred to the private partners. In the case study projects undertaken, the demand and planning risks were retained by the public partners. These risks were associated with the complete loss of project. There were certain other project specific risks which were also retained, like vandalism occurring during the school hours on all four case study projects.

**Transferred risks:** Risks transferred to the private sector. In case of all the case study projects, the design risk was transferred to the private sector along with other risks as identified in the risk register.

**Shared risks:** Risks shared by both the parties in a project. In the case study projects only certain construction and operating risks were shared. For example, risks relating to ground conditions of archaeological discoveries and operating risks of damage or destruction arising from an uninsurable event or civil unrest were shared. Operating costs increasing more than expected and allowed for in the indexation arrangements were also shared risks.

NAO (2011) claims due to the complexities of PPP arrangements, the public sector is still at a disadvantage in terms of RT. This was however not substantiated due to the lack of data from the public sector in relation to demonstrating VfM. The process of RT to the private sector comes with a cost to the public sector, which is currently still
not fully justified. RT is still very theoretical in terms of PPP assessment, as projects have still not reached the completion of concession period.

6.1.3 Value for Money (VfM)

Demonstrating VfM in a PPP school project was the most important aspect of development. However, VfM criteria used is found to be distorted when assessed from a partnership perspective (Pitt, M & Collins, N & Walls, A 2006). However, the VfM achievements are still inconclusive (ibid), which is basically due to lack of data as most of the projects are still in their operation stages.

On examining the procedure followed by the authority on the case study projects, it was identified that VfM criteria was achieved by strictly following the government guidelines and adhering to the four VfM assessments as laid in the Department of Finance guidelines (2007). Achieving VfM in a PPP project environment is based on PSB which has been argued by many authors in the UK (Ball, R. et al. 2003; Broadbent, J et al. 2008; Edwards, P & Shaoul, J. 2003a; Froud, J & Shaoul, J. 2001; Ismail, S & Pendlebury, M. 2006; Pollock, A.M. et al. 2002). However, the justification for higher cost of finance on a PPP project is decided by the degree of RT from the public sector to the private sector.

It has been clearly identified by the case study projects that inclusion of sustainability on PPP projects is greatly reliant on the contract documents and the public sector requirements. At this stage it is dependent on the private sector expertise and their experience in transforming these output specifications into the project specific requirements. This requires a certain amount of flexibility within the PPP procurement which was not seen due to detailed and prescriptive requirements on the case study projects to attain cost certainty (Hallowell, M. & Pollock, A. M. 2009).
Flexibility within PPP procurement can also promote innovation (ARUP, 2010b; McQuaid, R. W & Scherrer, W. 2010). It is argued the long-term concession period of PPP projects deters flexibility mainly due to associated risks (NAO, 2011). However, De Neufville, R. et al. (2008a) state that flexibility is crucial to drive value within PPP projects.

The case study projects undertaken demonstrate that the relationship formed between public and private partners is greatly impacted upon by the human resource. Relationships are the essence of partnerships within PPP projects (Eaton, D. et al. 2007; Kakabadse, N.K. et al. 2007; Smyth, H. & Edkins, A. 2007). Thus, right people are crucial and impact on the progress of the project (Hodkinson, S. 2011; McQuaid, R.W & Scherrer, W. 2010). Hence competency building plays an important role in developing the right human resource required in a PPP project environment.

In this research VfM is presented from the perspective of the sponsoring authority and establishes the drivers for inclusion of sustainability in the design of PPP school projects. The criticism that VfM on PPP projects is still theoretical, stands as the PPP school projects are still in operation stages and have not reached completion. However, sustainability inclusion in VfM process will ensure greater transparency (Pitt, M and Collins, N. 2006) by which scrutiny of information will benefit to improve the existing practices by following more innovative measures.

Cost: The design of the PPP school project greatly influenced the cost, as the project is financially assessed based on the PSB. The assessment is focused on meeting the PSB, using the PSB as the affordability criterion. Thus, the VfM assessment cost is a fundamental criterion in the design of project.

Value: Value was an important aspect of the case study projects. The design value each bidder can bring to the project was one of the key criteria for assessing the bids.
Moreover, this value was again based on the enveloped affordability and was measured against how well it performs to its designated functions and achieves its purpose.

Smyth, H & Edkins, A. (2007) had established the importance of relationship management within PPP/PFI projects in the UK to increase value. The relationship building is directly related to contract management and is linked to decision making. This ultimately relates to the people involved in the process and thus relates to knowledge, experience and interpersonal skills of the human resource.

**Income**: The last aspect of VfM is income generation. To generate income, the bidders had also included in their proposal the use of GP hall and fitness centre by the community after school hours. It also included the renewable energy generated by the wind turbines to be transferred to the grid.

The make-up of cost, value and income is all included in the bidders’ proposals. Ultimately, achievement of sustainability on a PPP project was greatly reliant on the enveloped affordability, which is assessed using the PSB. The project had to meet or equal the PSB for the project to be viable.

### 6.2 CSFs for achieving Sustainability:

A critical review of criteria required for achieving sustainability within a PPP project environment was carried out based on available literature. The literature review in relation to sustainability inclusion showed limited evidence in a PPP project environment.

In generating criteria relating to the CSFs in a PPP project environment, information was obtained from primary and secondary data related to the case studies. Criteria were identified and proposed by analysing the information obtained from case studies. This approach was appropriate, as no data was provided specific to PPP projects in the
existing literature review. Hence criteria specific to sustainability within a PPP project environment had to be generated using a bottom-up approach and from existing evaluation tools available for traditional projects.

This review was carried out using the literature available and relating it to the case study project documents. Once the key issues were identified by the case study, it was necessary to identify adequate criteria from the existing assessment methods such as Leadership in Energy and Environmental Design (LEED), BREEAM etc. and from standardisation or harmonisation works. This helped to compile and document criteria to form a list relating the three-pillars of sustainability (Social, Environmental & Economic). There are three types of criteria: firstly, criteria that already exists in one or several methods, are well documented and have consensus. Secondly, criteria that are not totally matured or well developed, or documented, needs clarifications, harmonisation and certain level of improvement and thirdly, criteria that do not exist, are not satisfactory, or needs development. The case study concentrated on compiling a list of criteria that were collated from existing different methodologies and filling the gaps, to the current criteria used on the case study projects. Thus, it was more of a bottom-up approach in demonstrating the authority requirements are fully covered. After compiling the list of criteria, interviews were conducted highlighting the various criteria which were then validated by the PPP project respondents. Refer figure 6.1.
Due to limited time and resource constraints, the criteria generated from each case study were validated by the case study respondents. An expert group approach was initially proposed to be conducted with the respondents. This, however, did not materialise due to respondents’ time and commitment constraints. Hence the validated process had to be improvised, based on the limitations and difficulties at hand. The process was carried out through interviews and feedback recorded.

The criteria identified in the respective case studies are shown in Table 6.1. The two bundles showed common criteria to the extent of sustainability inclusion followed on these projects.
Based on the findings from the individual case studies, the proposed criteria for sustainability inclusion within a PPP project environment from the perspective of the public sector are as listed in the table above.

As previously stated, the CSFs are dynamic in nature and influenced to a greater extent in a PPP project environment by the PESTLE factors as stated in chapter 3 section 3.7. Thus, the criteria relating to CSFs can be specific to a particular project and may greatly vary as the project moves to the operational stages. However, CSFs for achieving sustainability relating to Innovation, RT and VfM in a PPP project specific environment cannot be disregarded.
6.3 Findings of the case studies

This section will capture and present the findings from the multiple-case study. Initially, SB1 and SB2 bundle projects are presented with the respective case study project carried out under each bundle. The project descriptions are divided into three sub-sections according to the three propositions. A cross-case analysis is subsequently presented and the findings discussed.

On research commencement only the schools on the initial PPP pilot schools project had followed the PPP route. The SB1 and SB2 were the two projects in the pipeline and thus the research was restricted to these two projects.

Furthermore, implementation of SD will not automatically lead to the success of the PPP projects, as there were aspects perceived as more important to a PPP project which mainly related to cost. Neither is it implied that individual projects were completed without implementing SD practices.

Firstly, it is appropriate to revisit the propositions as presented in chapter 2:

**Proposition 1:** Sustainability inclusion on a PPP project is dependent on the relationship between VfM, RT and Innovation.

**Proposition 2:** Achievement of sustainability is dependent on a degree of flexibility within the PPP procurement.

**Proposition 3:** In a PPP project, trade-offs occur between social, environmental and economic sustainability in relation to endogenous factors.

6.3.1 Schools Bundle 1 (SB1)

As noted in chapter 5, SB1 had a total of 4 post-primary schools, of which 3 GCSF and PCD were examined as the case study. This section will deal with how these case study projects were assessed based on the three proposed propositions.
6.3.1.1 Proposition 1: Sustainability inclusion on a PPP project is dependent on the relationship between VfM, RT and Innovation.

Chapter 3 highlighted that a PPP project has an impact from exogenous and endogenous factors. The exogenous factors have been dealt in detail in chapter 3. This section will deal with the endogenous factors (VfM, RT & Innovation) which are mainly responsible for the inclusion of the degree of sustainability on PPP projects. These three factors were examined in detail for the case study projects. At the start of the project the authority creates various working groups to deal with the financial, legal and technical aspects of the project. These groups include representatives from the public sector as well as project specific private sector representatives. In this way a hierarchy of groups, i.e. project board, technical, legal and financial advisors, project managers and contract administrators, is formed. These groups are responsible for the creation of all necessary documentation within their areas. For example, the technical advisors are responsible for development of the output specification including technical and operational issues such as schedules of accommodation, functional adjacencies etc. These also required following educational and departmental policy, concerning school designs.

The DoES guidance documents on design and mechanical and electrical (M&E) services play a vital role in the development of the output specification in relation to the design of the project. The design guidance document outlines the design parameters, along with the flexibility required to future proof the accommodation. The M&E guidance document outlines the requirements for M&E in relation to school accommodation.
The research therefore, would investigate the impact of the three endogenous factors and identify the CSFs responsible for implementing social, environmental and economic sustainability on these school projects.

6.3.1.1 Social Sustainability: The three endogenous factors responsible for inclusion of social sustainability in the design of these schools (VfM, RT and Innovation), will be individually assessed based on the impact they would have on the social sustainability inclusion on SB1 school projects.

- **Innovation:** The case study identified that the project design documents were too descriptive, thus limiting design innovation in relation to social sustainability. It was agreed by 80% respondents that innovation was limited on SB1 project. Moreover, design innovation implemented was primarily of cost saving for the private sector during the life span of the project. Limited innovation was seen in relation to product enhancement.

- **Risk Transfer:** In relation to design risk, the private sector was careful in implementing innovation as it could increase their risk and could lead to potential non-compliance with the DoES guidance document. Consequently, innovation was viewed as an increase in risk, potentially to the extent that the project cost would exceed the PSB. This would directly affect their prospects of winning the contract.

- **Value for Money:** In relation to social sustainability inclusion, VfM was achieved by complying with the requirements as set in the output specification. If social sustainability criteria are clearly stated in the output specification then it is included and costed for in the PSB. This means that the project cost would equal or beat the PSB. Thus, it is in the interest of private sector to incorporate social criteria as outlined in the design and performance requirements as stated.
in the output specification.

6.3.1.2 **Environmental Sustainability:** In this section the three endogenous factors will be assessed for inclusion of environmental sustainability in the design of SB1 case study school projects i.e. Innovation, RT and VfM in relation to environmental sustainability inclusion on SB1 case study projects.

- **Innovation:** It was identified in the case study that the project documents limited design innovation in relation to environmental sustainability. Only those innovations that were part of the tender documents were incorporated. For example, it was a requirement to maximise the orientation of the school building to benefit from the solar gain, thereby minimising heating and lighting consumption. This would ultimately benefit the private sector in its running costs. Thus, it was agreed by 80% respondents that innovation was limited on the SB1 case study projects. However, the environmental innovation as implemented was primarily of cost saving to the private sector during the life span of the project. Moreover, limited innovation was seen in relation to green features i.e. photovoltaic, wind turbine, ground heat pumps, etc. to minimise environmental impact and use of greener energy.

- **Risk Transfer:** In relation to environmental risk, the private sector was reluctant to consider innovation which would bring greater design risk, potentially bringing about a non-compliance with the authority tender requirements due to increased project cost. Exceeding the project cost in comparison to PSB, indirectly affected their prospects of winning the contract.

- **Value for Money:** VfM in implementing environmental sustainability, was achieved by complying with the requirements as set in the output specification. The output specification is primarily developed based on DoES design guidance.
documents, the prevailing building regulations and the law of the land.

6.3.1.3 Economic Sustainability: A hugely important aspect of the PPP project, as it will not proceed unless economically viable. Thus, the economic sustainability drives the project in its real sense. The three endogenous factors play a vital role in the inclusion of economic sustainability. These have been further explained in detail below:

- **Innovation**: It was identified in the case study that the project documents limited design innovation, as they led the design in a particular direction with the aim of controlling the cost of the project.

- **Risk Transfer**: The private sector was reluctant to consider implementing innovation which would transfer greater design risk. Moreover, as previously mentioned, due to the highly prescriptive output specification, innovation was limited, which would mean a calculated risk had to be quantified within the project cost in relation to the design. Thus, all these factors affected the economic sustainability of the project which was constrained by the requirements and compliance requirements as stated by the public sector.

- **Value for Money**: VfM in implementing economic sustainability was achieved by complying with the requirements as set in the output specification. The economic assessment as defined and identified by the Department of Finance is very clear. The project has to equal or beat the PSB to be a viable PPP project. Thus, in relation to three-pillar sustainability requirements it was agreed by all respondents that on SB1 projects design innovation was limited, primarily due to prescriptive design requirements in the ITN documents. Overall, the interviewees considered the endogenous factors on a PPP project are critical in the
implementation of sustainability on SB1 projects for the previously documented reasons.

6.3.1.2 Proposition 2: Achievement of sustainability is dependent on a degree of flexibility within the PPP procurement.

The ITN documents provided by the authority consisted of a set of authority requirements and school requirements, which were functional and to some extent performance based. They were considered to be quite detailed as it set out the desired level of school activities along with adjacencies of how these accommodations should be preferably arranged. The brief was developed by the authority for each of the projects in this bundle. These included schedule of accommodation, functional requirements, educational policy, along with technical documents outlining the site layout plan, standard room layouts, fixed and loose furniture, etc. All information required for individual rooms was also documented in the output specification provided to the bidders.

School buildings in Ireland must comply with the building regulations and should be in line with the DoES guidance documents. However, these guidance documents are not mandatory, but recommendations setting out the criteria for the functional requirements in the schools; such as room layouts, corridor widths, acoustic requirements, etc which deal with the design requirements. However, it was clearly stated in the documents that the design should be in line with these documents.

Working in accordance with the DoES design guidance and M&E guidance, was at times regarded as quite challenging by the interviewees, as it was too prescriptive and led the design in a particular direction. Also, to mitigate the planning risk, all the four schools in this bundle were obtained with the outline planning which, to a certain degree, dictated the design and location of the school building on the
prospective sites. It was also mentioned to the bidders that they could apply for and obtain new planning permission if required, which meant that the planning risk would be transferred back to the private sector. The outline planning permission gave, to an extent, certainty of a full planning. The bidders preferred not to go down this route as it would impact on project cost and may impact on the project programme. At the procurement stage in the PPP process no costs are paid to the prospective bidders. Thus, it limits out-of-the-box thinking for the bidders in relation to the design of these projects. By the time the project agreement gets signed the designs are fairly developed. Thus, due to lack of flexibility in the procurement of design by the PPP route, it greatly limits the inclusion of sustainability on these projects.

In summary, the actors were well aware of the framework with which they had to comply. However, the project generated several instances of tedious discussions and minor disputes between the authority and the private partners, in particular in relation to fire and acoustics. These issues were all subject to lengthy negotiations, but were generally resolved in a timely fashion. It was also mentioned that there is more flexibility in implementing PPP projects in the UK and Australia as compared to Ireland. This is mainly due to the requirement that the project brief has to be developed in consultation between the end user and the private sector as part of the PPP procurement process, unlike the detail requirements provided in case of PPP projects in Ireland. However, this was argued by the public sector respondents as trying to keep consistency between the traditional and PPP projects. For example, one public sector respondent commented:
“We would not like a PPP project to be Rolls-Royce and a traditional project to be an economy mid-range car. Both procurement routes should produce same standard of accommodation. As these routes have been chosen only due to financial constraints”.

6.3.1.3 Proposition 3: In a PPP project trade-off occurs between social, environmental & economic sustainability in relation to the endogenous factors.

It was found that trade-offs occur between the three-pillar sustainability in relation to the endogenous factors in the case study projects. It was agreed by all respondents that social sustainability was the pillar least implemented and the project was more focused towards environmental and economic sustainability. Moreover, the three-pillars were rated by the case study projects in the priority of economic, followed by environmental and the least important as social sustainability. Economic sustainability was rated highest priority as it was responsible for the viability of the PPP project and environmental second due to legislation and the law of land requirements in relation to preventing environmental degradation. This was primarily due to regulations in place to prevent it from been neglected. For example, one public sector respondent commented:

“It is all about affordability at the end of the day, thus economic innovation in relation to risk and value for money play important role in the making and breaking of a deal. In olden days when environment was not protected by law, the construction industry only concentrated on making profit. In current times the environmental protection is legally binding and so would mean difficult to get out of, thus the social aspect is still very loose in terms of legislation. Hence it is the one that gets traded-off the most on a PPP project scenario”.

Social Sustainability: In relation to the three endogenous factors innovation is the least implemented in relation to social sustainability, followed by innovation in
design risk which brings greater responsibility on the private sector. VfM in social sustainability is implemented where benefits in cost-saving accrue, for example, maintaining thermal comfort would benefit in the running cost of the project, secondly orientation of building achieving best benefit from solar gain improves the productivity of people whilst using the accommodation in a way that helps in minimizing running cost. Thus, it was agreed by all respondents that social sustainability was rated last priority for bidders. Only those requirements forming part of the tender documents were incorporated.

**Environmental Sustainability:** The environmental sustainability as implemented on SB1 projects was mostly as included in the tender documents and compliant with the relevant legislation and building regulations. However, there was little innovation seen in relation to green technologies. It was identified by the respondents that the overly descriptive output specification limited innovation. However, it was also identified that there was no appropriate marking included in the evaluation for inclusion of green features. Moreover, SB1 was the first bundle of projects implemented after the pilot projects, thus the bidders were cautious in trying alternatives. It was also mentioned by some respondents that the quality/cost ratio of 60/40 was very tight and prevented innovative thinking.

**Economic Sustainability:** The economic sustainability of the SB1 project was the most important aspect of the PPP project as it would not proceed if not economically viable. Thus, the economic sustainability drives the project in its real sense. The three endogenous factors play a vital role in the inclusion of economic sustainability. Innovation in design to minimise cost, take appropriate risk as identified in the risk register and to comply with the VfM assessment which is basically to equal or beat
the PSB. Thus, it was agreed by all respondents that economic sustainability was the most important aspect of the PPP project.

6.3.2 Schools Bundle 2 (SB2)

As in chapter 5, SB2 was a bundle of six school projects of which five were post-primary and one primary. Two of these projects (KCS and ACS) were selected as case study projects. This section will deal with how the case study projects were assessed on the three proposed propositions.

6.3.2.1 Proposition 1: Sustainability inclusion on a PPP project is dependent on the relationship between VfM, RT and Innovation.

The detail of the impact of endogenous factors on the SB2 case study projects was highlighted in chapter 5. Based on that analysis, this section will further ascertain if proposition 1 is valid in the case of these projects. Similar to the SB1 projects, the SB2 projects were also setup with technical, financial and legal working groups, which had representation from both the public and private sector. The hierarchy of groups was determined along with the responsibility set for the developing of the required documents in relation to these projects. These groups were responsible for the creation of all necessary documentation within their areas. However, the one fundamental change from the SB1 setup, was that the legal requirements were set as a compliance issue, eliminating non-compliant bidders. This benefited the marking system as more marks were available to the technical matrix. Similar to the SB1 project, the SB2 project had to adhere to the requirements as set out in the tender documents.
The research therefore will assess the application of the three endogenous factors and identify the CSFs required for implementing social, environmental and economic sustainability on these school projects.

6.3.2.1.1 Social Sustainability: This section will address the three endogenous factors responsible for inclusion of social sustainability in the design of the SB2 case study projects: Innovation, RT and VfM. These will be individually assessed based on the impact they would have on the social sustainability inclusion on SB2 case study school projects.

- **Innovation:** The respondents argued that SB2 projects demonstrated greater innovation measures. The output specification on SB2 was descriptive, but still facilitated innovation, as the marking matrix for technical was increased in SB2 as compared to SB1. The marks ration in SB2 was 70 for technical and 30 for cost which promoted flexibility in design. However, it was agreed by 80% respondents that innovation was still limited on SB2 projects, albeit greater than on SB1 projects. It was also accepted that the innovation implemented was primarily cost saving for the private sector during the life span of the project and that product enhancement innovation was limited.

- **Risk Transfer:** On the SB2 projects it was agreed that greater design innovation was achieved due to the flexibility in the design requirements in the output specification. Examples of main boundaries set for the design development by the public sector were: the schedule of accommodation was signed-off and provided to the private sector, the performance requirements were identified in the document along with the supporting documents, e.g. standard room layouts etc, were also provided as reference to the private sector. On these projects,
calculated design risks can be observed which could also allow the experience and composition of the private sector to be used to implement these ideas on the project. Hence SB2 saw greater design risks being implemented on the projects, whilst achieving a balance between project costs and meeting the PSB requirement. This, in the 90% respondents’ opinions, was achieved through the application of the experience and knowledge of the private sector project team.

- **Value for Money**: In relation to achieving VfM in implementing social sustainability on SB2 projects was in complying with the requirements as set in the output specification. The private sector was careful in implementing innovation in social sustainability criteria as it could attract greater risk in relation to cost. Thus, the bidders’ main intention was to equal or beat the PSB and have greater chance of winning the project.

6.3.2.1.2 **Environmental Sustainability**: In this section the three endogenous factors i.e. Innovation, RT & VfM were assessed in relation to environmental sustainability inclusion on the SB2 case study projects.

- **Innovation**: Innovation in environmental design was enhanced on SB2 case study projects, through the incorporation of greener energy features such as use of photovoltaic panels and a wind turbine to generate electricity. The SB2 case study projects also introduced rainwater harvesting into the design. These innovative measures were of a cost-saving nature, benefitting the private sector for the duration of the project.

- **Risk Transfer**: On SB2 projects, a calculated environmental design risk was taken by the private partners. The designs showed innovation by including photovoltaic and wind turbines for alternate sources of energy. However, an
argument against innovation is that if innovation is limited, then the project risk is better quantified and ultimately reflects in a more realistic project cost. Thus, the private sector implementing PPP School projects have a greater control on the profit margins for the duration of the life of the project.

- **Value for Money**: In relation to VfM assessment of environmental sustainability as implemented on SB2 school projects, it is noted that the private sector took greater initiative in complying with the requirements as set in the output specification and in taking calculated risks based on the experience of the private sector on other PPP projects.

6.3.2.1.3 **Economic Sustainability**: In the three-pillar sustainability model, economic sustainability is the most crucial and important aspect of the model, as it will not proceed if it is found to be economically unsustainable. Thus, demonstration of economic sustainability is a key critical success factor. The three endogenous factors play a vital role in the achievement of economic sustainability as follows:

- **Innovation**: All respondents noted that the SB2 project demonstrated greater innovation in relation to project cost, with the inclusion of renewable energy design which could minimise the projects’ running costs. The project costing on SB2 facilitated the inclusion of innovation in relation to sustainability. Thus, it was agreed by all respondents that innovation was implemented in relation to economic sustainability on the SB2 projects which was primarily of cost saving and to some degree product enhancement.

- **Risk Transfer**: On the SB2 projects, the risk registers clearly identified the risks transferred to private sector and the risks retained by public sector. All design risks were private sector responsibility. One respondent commented as follows:
“The lessons learnt from SB1 project greatly helped the SB2 projects as the private sector was more informed about how the contracts work and the flexibility it provides in design risk of a project”.

This allowed the private sector to take calculated risks in relation to providing innovation which would ultimately benefit in the long term VfM assessment.

- *Value for Money*: In relation to achieving economic sustainability, on SB2 projects was primarily by achieving the PSB cost. This primarily included the cost of a project and the value it brings to the project.

Thus, in relation to three-pillar sustainability requirements all respondents agreed that some limited innovation was achieved. This was primarily due to prescriptive requirements which limited innovation in design. Overall, the respondents considered the endogenous factors as critical in the implementation of sustainability on SB2 projects for the previously documented reasons.

**6.3.2.2 Proposition 2**: Achievement of sustainability is dependent on a degree of flexibility within the PPP procurement.

Similar to SB1, the SB2 tender documents were prepared by the authority. These documents reflected the authority and end user requirements documented in the form of functional and performance-based outcomes. 80% of the respondents stated that SB2 documents were more performance based and had more flexibility as compared to the SB1. This was one of the areas where SB1 lessons learned were implemented. On PPP projects, the bid documents included all of the authority requirements in terms of accommodation, complying with current, prevailing and most up-to-date building regulations. Unlike educational projects, all this information is required to be documented in the output specification provided to the bidders.
On the SB2 projects the procurement procedure started with competitive dialogue and was changed to negotiated procedure. It is the understanding of all the respondents that the negotiated procedure offers more flexibility in terms of design development. The documents provided were performance based which gives flexibility in the project design. Thus, it was accepted by all respondents that the project allowed the inclusion of sustainability measures, especially in relation to environmental sustainability and greener parameters. The SB2 projects saw the inclusion of greener energy initiatives like the wind turbine and photovoltaic.

It was also agreed by 80% respondents that the ratio of 70/30 split between quality and cost greatly helped the inclusion of greener technologies on SB2 projects. Also, personnel involved in the project and their background and knowledge on sustainability can contribute to the inclusion of sustainability in its entirety. One respondent commented:

“We have seen greener technologies being implemented on SB2 projects which is mainly due to the 70/30 split of quality to cost. If we give more weighting to quality then we will get good quality projects.”

In summary, the private and the public sector parties involved in the SB2 projects were well aware of the framework with which they had to comply. These projects were carried out when the economy of the country was in crisis, thus the main concern on both parties involved, was to get and secure the funding. However, all respondents agreed that the SB2 projects saw greater flexibility in relation to inclusion of sustainability.

6.3.2.3 **Proposition 3:** In a PPP project trade-off occurs between social, environmental and economic sustainability in relation to the endogenous factors.
In was agreed by all respondents that on a PPP project, trade-offs occur between the three-pillar sustainability model and that social sustainability is the pillar least implemented. The projects are more focused towards environmental and economic sustainability. In case of rating the three-pillars, economic comes first followed by environmental and the least is the social sustainability. 50% of respondents stated that the economic and environmental requirements are closing the gap because of the legal requirements to comply, mitigate and maintain the environment. The strong compliance of environmental requirements is taking precedence over economic requirements.

**Social Sustainability**: In relation to social sustainability, innovation in design is the least implemented, followed by design risk. Most of the social sustainability in relation to design implemented by private sector was done to achieve a cost saving for the private sector in the running of the facility, thereby increasing private sector profit. Similar to SB1 projects, SB2 projects saw social sustainability implemented which were of cost-saving type for example, orientations of the building, thermal comfort etc. Thus, all respondents agreed that social sustainability was the least implemented and only those that are of cost savings to the bidders were implemented.

**Environmental Sustainability**: The environmental sustainability as implemented was as required by the tender documents and to achieve compliance with the relevant legislation and building regulations. However, SB2 also demonstrated innovation in relation to green technologies. It was noted by all the respondents that the output specification of SB2 was more generic compared to that of SB1 and thus did not limit innovation to the same extent. However, it was also identified that there was appropriate marking included in the evaluation for inclusion of green features. Moreover, it was also noted by 80% respondents that the ratio of 70/30 actually
helped in introducing green features, thus promoting innovation in environmental sustainability.

**Economic Sustainability:** The economic sustainability of the SB2 project was very important as the project was implemented at a time of global recession. Thus, the most important aspect of this project was funding and viability. Hence the economic sustainability drove the project in its real sense. At the time of global economic recession, the three endogenous factors played a vital role, innovation in design to minimise cost, and minimising risk as identified in the risk register and achieving VfM, through keeping cost below that of the PSB. Thus, it was agreed by all respondents that economic sustainability was the most important success factor of the PPP project.

6.3.3 **Cross-case analysis:**

*This section compares SB1 & SB2 in relation to the three propositions.*

6.3.3.1 **Proposition 1:** Sustainability inclusion on a PPP project is dependent on the relationship between VfM, RT and Innovation.

This section analyses the relationship between the three endogenous factors of the two projects (SB1 & SB2) and how they relate to the sustainability inclusion. From the case study it is clear that sustainability as implemented on SB1 was primarily driven by compliance with the authority requirements. Very limited innovation was seen on all projects included in SB1. In comparison SB2 project should greater innovation as compared to SB1 in relation to environmental sustainability, some economic sustainability and limited social sustainability.

- **Innovation:** In case of SB1 projects innovation was limited to compliance, there was no real innovation in terms of product enhancement, whereas most of the
innovation implemented was of cost saving to the private sector. It is also perceived that innovation adds costs and that this would affect the VfM and risk matrix on a PPP project. As it was one of the first PPP bundle projects in this programme, the bidders were trying to keep the design as close to the requirements and the marking matrix. In case of the SB2 projects the PPP market had the experience of SB1 and both the authority and the private sector were more familiar with the process and its implications. Thus, SB2 showed greater inclination towards sustainability as compared with SB1.

- **Risk transfer**: RT on the SB1 project was relatively straightforward. Various risk workshops were conducted to identify the risks in SB1 project. As all these risks have to be quantified in the risk matrix and appropriately valued in the PSB. Thus, the designs were restricted to the requirements as any deviation would result in risks which could possibly add cost to the project. In case of the SB2 projects, the procurement procedure was much more flexible and thus saw innovation in relation to cost saving and to a limited extent, product enhancement.

- **Value for Money**: In case of the SB1 project, VfM was greatly perceived as complying with the requirements. Any deviation from the requirement meant additional cost. Thus, innovation was limited and any design change that would bring the risk on the project was avoided. Due to this, VfM was equated with affordability. In case of the SB2 project, greater innovation was seen in case of environmental sustainability thus allowing the SB2 project to achieve greater VfM as compared to SB1 project.

Thus, all the respondents agreed that sustainability inclusion on a PPP project is dependent on the relationship between VfM, Risk transfer and Innovation.
6.3.3.2 Proposition 2: Achievement of sustainability is dependent on the degree of flexibility within the PPP procurement.

The SB1 & SB2 projects were the first PPP school projects that followed the PPP procurement route since the grouped schools project, completed in 2003. In the case of SB1, the procurement procedure was developed with a set of guidance documents that outlined the design of school buildings by the traditional procurement route. These were included in the output specification which made it more prescriptive. TGD in relation to design, M&E and standard room layouts were also provided. Similarly, on SB2, TGD in relation to design, M&E and room layouts were provided along with the output specification. Thus, in all, a very detailed requirement was provided by the authority in relation to SB1 & SB2 projects. However, the main difference was the distribution of marks for quality and cost. On SB1 quality/cost ratio was 60/40 which required a very tight balance between design and cost. Whereas on SB2 the quality/cost ratio was 70/30 which meant that there was more flexibility in relation to the design of the project. Secondly, the marking matrix was different on SB1 and SB2. SB1 had very detailed marking matrix whereas SB2 had a marking matrix which was based on comparison between the bids. The marking matrix was very detailed on SB1 whereas it was relatively simple on SB2. Also, SB1 project was implemented by negotiated procedure which limits design innovation as compared with the SB2 competitive dialogue which has greater interaction with the bidders in relation to the development of the bid proposals. Whilst, the authority changed competitive dialogue procedure to negotiated procedure during the tender stage on SB2, elements of the initial approach remained. This is an area that would be worthy of future research to ensure that PPP is further developed.
Thus, all the respondents agreed that flexibility in PPP procurement is directly related to the inclusion of sustainability.

6.3.3.3 Proposition 3: In a PPP project, trade-offs occur between social, environmental and economic sustainability in relation to the endogenous factors.

In the SB1 projects, there was limited design innovation compared with the SB2 projects. This was a consequence of the way that the authority requirements were laid out in the tender documents. The SB1 documentation was considered to be more prescriptive and the marking matrix was based on individual project marking, whereas in the SB2 projects the marking matrix was relative and assessed based on comparison between the three bidders. Also, the quality/cost ratio in SB1 was 60/40 as compared to the SB2 project where the ratio was 70/30. This meant that the design of the project in SB2 had more weighting compared to that on the SB1 project. Thus, it was agreed by the respondents that the design innovation was better achieved on SB2, compared to SB1.

In relation to risk, the SB1 project restricted sustainability gains in social, environmental and economic design to what was required in the tender documents. The risk workshops conducted, clearly identified the risks that were private sector and those that were public sector. Overall, the risk management on the four SB1 projects was quite simplistic in comparison with current standards. All the projects show evidence of the actors involved identifying, assessing, allocating and mitigating risk in a more structured fashion than had traditionally been the case. Thus, all the respondents agreed that the composition of how the projects were set up limited the private sector from trying alternatives and hence it was in the interest of the private sector to minimise the risk by carrying out solutions which were acceptable to the authority.
In relation to sustainability and VfM discussion, as previously noted, the private sector was more focused on equalling or beating the project PSB in both projects. However, it was argued by some respondents that SB2 showed greater VfM in comparison with SB1, as the project showed greater design innovation in terms of environmental sustainability, with the introduction of greener energy, water conservation by rainwater harvesting etc.

Thus, in conclusion all respondents agreed there is trade-off between social, environmental and economic sustainability in relation to the three endogenous factors. The least focus is on social followed by environmental, with the most important being the economic sustainability. It was also highlighted by the respondents that social sustainability as implemented on these projects was directly related to the requirements in the tender documents, as it is not supported by legislations or building regulations.

6.4 Summary

These case studies were undertaken to investigate how the authority and the private sector involved dealt with the issues of sustainability (social, environmental and economic) and the framework under which the projects were undertaken. The descriptions given are, therefore, to some degree limited as they deal mainly with these issues. It should not be forgotten that project success would derive largely from the actions and interventions of the various parties involved in the project and those associated with them. Thus, it is acknowledged that all construction projects, from concept to completion, present a number of alternative routes for reaching the established objectives and that factors of significance for the actions taken and results achieved on the project might have existed outside these three main areas. It is clear from the case study projects that these projects showed limited innovation where more
prescriptive requirements forced the private sector to take the design in a particular direction. Detail risk workshops clearly identified the risks transferred to the private sector. It also clearly identified risks that were retained by the public sector and the risks that were shared by both parties. Whilst not surprising, this observation indicates that even though an innovation is more likely to be successfully implemented if the private sector is clear over the risk allocation and, hence, is able to make rational decisions based on it, the allocation also has to be appropriate and manageable. This gives a clear understanding of the situation which helped the private sector to take decisions in relation to the design of the project. Consequently, it has been found that sustainability inclusion on a PPP project is dependent on the relationship between ViM, RT and Innovation.

The second proposition which states that achievement of sustainability is dependent on a degree of flexibility within PPP procurement is also worthy of further comment. The notion of design freedom is frequently brought forward as a positive aspect of the PPP arrangement. However, the findings suggest that there is considerable confusion over what exactly is meant by design freedom and that it could severely complicate procedures. In concordance with the stated proposition, the findings show that there is little or no scope for a PPP project to deviate from the traditional design standards. Hence, there seems to be very little room for design freedom except in the early conceptual phases.

The output specifications provided on the four projects were similar in style and detail. It was seen that a lot of innovation requirements were just aspirations and no specific link was provided to the actual marking matrix in relation to awarding the contract. The public sector argues, if the output specifications are handled and communicated appropriately between the public sector client and the private sector, more
sustainability in design could be developed, as opportunity lies with the private actors to perform the specific tasks that best suits their expertise. There is considerable reason to be cautious in propagating for limitless freedom for the private sector to design as they choose – the downsides of such an arrangement are many. A clear potential downside for the public sector client and to some extent the project company, is the limited degree of change allowed in the contracts. Hence, both the public and private sector must be comfortable in the meaning of design freedom. Both sides from the outset need to be certain of what the private partners limitations are under the current project circumstances.

It has also been stated on a number of occasions in this document that the manner in which the contracts are formulated make it difficult to make changes as the project develops. The findings suggest that the project outcomes benefit from a certain level of agreement having been reached before the contracts are signed; or put somewhat differently, the little scope provided for changes makes it crucial that early input is provided from those involved. Clear strategies should be put in place so that information from the operator and end users could be obtained and dealt with in a timely fashion. A better result can be achieved if greater understanding between the public sector client, the project company and the contractor in understanding the drivers and motivators of the project.

Ultimately, the attitude has to be one of convergence and openness in the negotiations and mutual understanding of the other organisations’ views and motivators. The four case study projects succeeded in creating an environment that enabled the key participants to work together rather than against each other. They were able to strike a clear balance between the overall goals of the project and the individual organisations’
own agendas and, hence, able to minimise the degree of opportunistic behaviour from the private partners as well as the public sector.

The third proposition states that in a PPP project, trade-offs occur between social, environmental and economic sustainability in relation to endogenous factors. It has been established by the case study projects that these three factors are the main drivers of sustainability in a PPP project environment from strategic level to the individual project level. It has also showed that economic sustainability is at the core of all processes followed by the environmental sustainability and thirdly social sustainability. The economic sustainability is the driver of the PPP process and ideas that fit within it are only implemented, or else the requirements which are legally binding or are legislatively required by law of land get implemented. This supports the environmental sustainability as there are requirements which are required to be implemented by law of land. The social sustainability is more dependent on the private sector and their policies and the experience and knowledge they can bring to the project on this pillar. Thus, social sustainability is traded off against environmental and economic sustainability in a PPP environment. This is further supported by the three factors pertinent to the PPP project environment which are linked to the three-sustainability pillar. Thus, in a design context, social design innovation is least implemented on PPP projects compared to environmental design innovation and economic design innovation. This is related to RT and VfM assessment on a PPP project environment.

In general, both projects succeeded in creating an environment that enabled the key participants to work together rather than against each other. Refer to Figure 6.2.

The next chapter will draw down from the case study and the analysis carried out to develop a step-by-step guide to be used to improve the incorporation of sustainability on PPP educational school building projects in Ireland.
Figure: 6.2 Mind map of chapter 6
CHAPTER: 7

FORMULATION OF MODEL

7.0 Introduction

The fieldwork presented information that provide various insights and inquests into the nature of PPP projects for the construction of Irish schools. The findings give a reality of the major patterns and systems of instituting sustainability into these projects.

This chapter focuses on the findings of the first six chapters and draws the knowledge gained to address the first four objectives. It then proposes a conceptual model in the form of a step-by-step guide which will be used to investigate to improve the implementation of sustainable development practices incorporated in educational PPP school projects in Ireland. As stated, this research aims to identify the similarities and differences between the two main topics PPP & sustainability undertaken by this research. At the initial stages the concepts of PPP and sustainability were compared based on core principles shared, as illustrated in Figure 7.1.

![Figure 7.1 Links between PPP and Sustainability](image-url)
It has also been highlighted through literature review that there has been very little study done on comparison of these two topics as they are two big topics in themselves. Research has also shown that due to the very nature of these two topics it has been very difficult to find direct related materials and thus research was carried out based on case study of the two bundles of PPP school projects. One of the issues raised in the literature review in relation to the fact that there are considerable differences in the knowledge base on these two topics between the public and private partners. Thus, further investigation was carried out on the challenges arising due to this difference.

It has also been established, in the previous chapter, that sustainability has a significant role in PPP project environment. In implementing sustainability on PPP projects three main components are of primary concern, namely: VfM, RT and Innovation. However, it is also important to see how the PPP project is affected by the external factors which are basically categories of PESTLE taxonomy. The PESTLE analysis on PPP has been carried out in detail in chapter 3.

![Integrating Sustainability into PPP Environment](image)

*Figure 7.2: Integrating sustainability into PPP environment.*
The public partner’s use of PPPs is influenced by priorities, requirements and policies. Thus, it is essential to understand the requirements of the end user and how they can be achieved within the current public sector policies. To implement this, the process brings together people with diverse and varied backgrounds who need to focus and work together in achieving the common goal. Thus, it is a constructive chaos from a management perspective which needs to be managed. Thus, a management conceptual model of Plan, Do, Check, Act (PDCA) is been proposed to harness the constructive chaos and convert it into a systems approach model.

![Figure 7.3: Chaos into integration a Management approach.](image)

7.1 Development of Proposed Conceptual Evaluation Model

This research will now concentrate on developing the conceptual model to help greater inclusion of sustainability criteria i.e. Social, Environmental and Economic criteria. There are several different types of conceptual models, many of which have been used for centuries (Griggs et al. (2014). However, the type of conceptual model to be used depends on the purpose and type of information to be arrived. Bearing in mind that the overall aim of this research is to promote greater effectiveness of sustainability in PPP projects, the
model must address the PPP process and the outcomes of the process. By definition therefore, a process model is required. In its simplest form, a process model has three principal parts as illustrated in Figure 7.4. Taking this process to the next level, it is essential to identify the challenges faced by PPP school projects and to incorporate the sustainability focus that must be addressed. This depends on the inputs provided and identified at the start of the project.

![Simple Conceptual Model](image)

**Figure 7.4: Simple Conceptual Model (Adapted from Astin’s IEO, 1999)**

The output specification is the basis of the design and of the extent to which sustainability can be incorporated on building projects. However, the output specification is based on the requirements as identified by the public partners. The policies and procedures put in place for implementation of PPP projects by the public partners play an important role. It also relates to the true partnership formed between the parties which could also influence the sustainability requirements. These outcomes could be judged as successful if they meet the objectives of a true partnership approach. For example, a successful social value outcome would be achieved where all parties in this partnership are working jointly towards achieving these value objectives. Thus, this model needs to be flexible to
incorporate project specific objectives and relate to the outputs required at individual project level.

The process part of the model would encompass the stages through which the PPP process is conducted. As noted in the literature review, the PPP process is far from perfect and sometimes results in undesirable outcomes. However, the process itself is subject to inputs. These include the guidelines under which the process operates, the market conditions and the contracts used to form the partnerships. A number of further currently unidentified inputs may also exist and it is important that the model could be used to find any such inputs.

By including these factors, the model takes on a more sophisticated appearance as shown in Figure 7.5.

Using this model, it will be possible to examine a fixed input and trace its influence through the process to predict the likely outcome. By including a feedback loop as shown in Figure 7.5, the model can be used to learn from the experiences of past projects and regulate the inputs on new projects to get the desired output.
There are various sustainability models available and the most widely been used is the Triple Bottom Line (TBL). As the project environment is so diverse and cannot have constant parameters each project needs to develop its own evaluation parameters based on the sustainability requirements of endogenous and exogenous parameters. The Centre for Sustainable Organisations provides guidelines on developing management systems which would adhere to sustainability implementation strategy. It recognises that, only when commitment to sustainability is at the heart of every organisation, will the activities performed by these organisations show commitment to sustainability in its entirety. A piecemeal approach will only partly incorporate sustainability.

![Figure 7.6: TBL sustainability framework.](image)

Based on this framework, a management approach to development of conceptual model for evaluation of PPP projects have been developed (see figure 7.7 & 7.8).
The CSFs for sustainability have been identified in the literature review and four case studies were investigated as part of this research. The factors within those cases were found to demonstrate similarities and variants. The school PPP projects produced similar CSFs for sustainability. The factors were: VfM, RT & Innovation; these indicated that CSFs are specific to the project and that while they mean different things at the project level, these factors represent sustainability at the strategic level of the project. Hence it is possible to generalise the representation of these factors from a PPP project environment with regards to sustainability. Thus, the CSFs for sustainability inclusion from a PPP project environment are as follows:

- VfM.
- RT.
- Innovation.

These CSFs are envisaged to ensure that a PPP project is sustainable and progressive throughout its concession period. Subsequently the factors highlighted will enable the public sector to focus on enhancing the PPP procurement over time as a result of the changes that occur to the internal and external factors.
The impact of the internal and external factors onto these processes causes a chain reaction to the sustainability inclusion on a PPP project. This has been shown using the triangle over the three-pillar sustainability model. The graphical representation of the equilibrium between the core processes can thus be viewed and if there are indications that the equilibrium could lead to instability, corrective measures could be initiated in ensuring that stability is maintained. The research also highlighted the changes that can occur based on the external environment, which was assessed with a PESTLE based analysis of the PPP project environment in chapter 3.

It will also be possible to use the model in reverse, where a specific output is required. To achieve this, the process conditions for the outcome will be defined and the inputs will be analysed to establish whether the required process can in fact take place. Using the model in this way will allow PPP practitioners to assess the inputs that are necessary to achieve a specific outcome.
Figure 7.8: Management Approach
7.2 Proposed Step-by-step guide to achieving sustainability (Process Model Approach)

Government officials are the main drivers of the PPP process, and have an important opportunity to incorporate the principles of sustainability into legislation for PPPs. For sustainability to happen it must be made explicit and measurable (UNECE, 2010). There is no single template for sustainable development (UNECE, 2010), thus giving the procuring Authority a greater flexibility in how they interpret the principles. Hence, it is a process that needs to be followed which could lead to sustainability. This is based on the paradigms identified in the observations from the four major cases studied and to identify the way private and public spheres interact in these projects. In this section a step by step guide is been developed and proposed based on these findings in an attempt to achieving sustainability.

**Strategic level:**

*Establish DoES overall strategy on sustainability.*

DoES published its first educational sustainability strategy in 2014 (refer to chapter 3 section 3.7). Thus, at the time of examining the case study projects, no sustainability strategy for education was in place for implementing school building projects. This strategy will now help in developing individual sustainability policy for various departments within the umbrella of DoES, ultimately benefiting the implementation of future PPP school building projects.

**Project level:**

*Step 1: Integrate Sustainability into the PPP Environment*

With the existence of an overall sustainability strategy established, there is a clear commitment to sustainability at the strategic level of the project. The overall DoES strategy on sustainability should be integrated into various activities performed under this sphere. Thus the PPPs should also have a policy in place which will depict the main
essence of the overall strategy. This can be achieved by streamlining the TBL standards (explained in section 7.1) to bring together stakeholders, measurement standards, project strategy and research and development. This strategy should clearly address the three pillar sustainability model in entirety – Social, Environmental and Economic. These parameters will have to be identified and defined at the start of a project in order to embed sustainability and show a clear direction and seriousness of including and achieving sustainability on PPP projects.

**Step 2: Appropriate resource allocated for the project**

Identifying the needs of the project in hand and allocate appropriate resources that would facilitate sustainability inclusion and implementation. It is essential to allocate dedicated resources with the expertise in sustainability on PPP projects that would ensure & monitor the inclusion of sustainability requirements on individual projects. It is essential to have a dedicated team with the knowledge and know-how of sustainability to implement the same on these projects. If this is not achieved, we will only see piecemeal incorporation of sustainability on projects.

**Step 3: Develop action plan for Sustainable PPP school building projects incorporating & identifying key sustainable goals and objectives of the project.**

The elements of sustainability in construction projects are generally very chaotic if not well planned. Thus, every project needs to embrace the goals and objectives of sustainability within each project requirements. It is essential for the project team members to come together to develop expectations/requirements of all stakeholders by developing project specific goals and objectives for the project in line with sustainability requirements, thus adapting a management approach of PDCA to guide through the various stages of the project. This would provide a guide to the project teams to PDCA in identifying and implementing the requirements of a project. This will help and lead to a clear action plan for the project in relation to sustainability inclusion.
The action plan would draw closer to formulate and include the main parameters that must be included in order to ensure that sustainability is attained. To achieve optimal results, this action plan must be in two forms. The first part must include and focus on the sustainability expectations within the three main areas – Environmental, Economic and Social components and how they interact with VfM, RT and Innovation. The second part must define how the Private, Public and Partnership elements come together to meet these ends.

The project team should conceptualise, act and plan within the context of Sustainability by defining the Social, Environment and Economic Sustainability goals & objectives of the project to be executed. They must then define the various input and output measures and standards specific to the project in terms of Private, Public and Partnership responsibilities.

**Step 4: Draw a Practical Framework for deriving the criteria to be included in Output Specification (OS). Thus developing OS that addresses and ensures the inclusion of sustainability goals & objectives set for the project.**

In terms of including sustainability, the contract is the only legally binding document that defines the relationship formed between the public and private partners on a PPP project over the life of the project. Thus OS is critically important as it forms part of the contract document. The inclusions of output requirements are very specific to individual project. However, the OS should be able to translate sustainability requirements into clearly measurable performance requirements of a given project, thus critically outlining and aligning the various PPP projects stages with the sustainability requirements of the project. To achieve this the OS must lay out detailed elements of Input and Outputs for various stages of the project.

- Integrate sustainability into the priorities of the project,
- clarify grey-areas.
• Clearly identify Social, Environmental and Economic sustainability criteria to each stage into measurable performance requirements of the project in line with the overall sustainability goals and objectives set for the project.

**Step 5: Develop the contract documents to include sustainability parameters to be reflected in the award criteria.**

The contract document must identify the specific Social, Environmental, Economic sustainability parameters and allocate them appropriately to public and private partnership.

The award criteria must include sustainability and should be rewarded and incentivised in bid evaluation for private partners to provide innovative and sustainable solutions. Since the PPP projects are awarded based on Cost & Quality, social and environmental requirements form part of the quality criteria. If these criteria are not incentivised by the public partners, they will not appear in the bids. However the public partners can further attract the private partners by allocating a component of marks within quality specific for sustainability.

**Step 6: Develop Strong/Stringent Evaluation procedures in relation to sustainability inclusion.**

When the project commences, the sustainability targets and standards must be observed closely. This include the evaluation and assessment of results in relation to the delivery of the project. Evaluation is based on the input-output targets and it must be closely followed and evaluated in order to ensure that targets and key milestones are being met of the project. This would help to make the project meet its sustainability targets more precisely.
Step 6a: Review 1

Review the project after the construction of the project is completed to find any shortfall in the process/policy in relation to sustainability requirement. Lesson learned to be used for further PPP projects to be implemented.

Completion of Implementation stage.

Step 7: Develop Strong/Stringent Monitoring procedures for the project with feedback control.

When the project is complete and the operation stage commences, the sustainability targets and standards must be observed closely. This include the performance assessment of the project during the operation stage. Monitoring is based on the input-output targets and it must be closely followed and monitored in order to ensure that targets and key milestones are being met for throughout the project. This would help to make the project meet its sustainability targets more accurately.

Step 7a: Midterm review

Mid-term review to be carried out after the project is operational to find any shortfall in the process/policy in relation to sustainability requirement. Lesson learned to be used for further PPP projects to be implemented.

Half way to the Operation stage

Step 8: Final review of the project to capture lessons learned. Review the entire process to document the shortfalls in relation to sustainability implementation. Review the PPP policy if need be for delivering PPP by integrating lessons learned to reflect along with other areas the shortfalls captured in relation to aspects of sustainability. Integrate and update the current policy to reflect learning outcomes. (Repeat Step 1 where Necessary to Broaden Scope)
In cases where there are major gaps, there will be the need to revise the documents. In extreme cases, the overall PPP related sustainability policy will have to be changed to reflect the learning outcomes. This would mean altering or modifying the process and procedures to reflect the learning outcomes. In cases of minor adjustments, the changes must be restricted to the specific units of the project and it should be documented. Develop a feedback loop to capture change and reflect the learning outcomes.

### 7.2.1 Process approach to developing model:

In section 7.2 a step-by-step guide is proposed to achieve sustainability in a PPP project environment. An eight step process model is designed to achieve sustainability in a PPP project environment. This is further developed into strategic and project level process model diagrams as presented in figure 7.9 and 7.10 respectively.
Figure 7.9. Proposed step-by-step guide to achieving sustainability in Irish PPP school building projects
Figure 7.10. Proposed step-by-step guide to achieving sustainability in Irish PPP school building projects (Project level)
7.3 Testing of Proposed Model

The integration of sustainability in the construction of educational projects in Ireland can be achieved by implementing an 8-point conceptual model in the form of a step-by-step guide as proposed in this research. This is outlined in Table 7.1 below. It shows the main stages and processes through which sustainability can be integrated and instituted in a PPP project.

Table 7.1 outlines the basic framework within which further research can be meaningfully carried out. This will need to be further developed and critiqued in a form that would bring out the best and most efficient results for sustainability inclusion on a PPP project. This model is further tested in relation to the possible outcomes required by a project in relation to sustainability. The tests would seek to provide credibility to this method for replicating on other projects. This will help in standardising of approach to achieve optimal results.

In order to undertake a proper evaluation of the model and make it as workable as possible, there is the need to look at the reliability and validity factors into greater detail. Thus, the testing of model should include the following validity, credibility and transferability and reliability.
**Table 7.1: Proposed Step-by Step guide to achieving Sustainability in Irish PPP School building Projects (Process Model Approach).**

**Strategic level**

Establish DoES overall strategy on sustainability:
- Inbuilt the overall strategy into individual departments within DoES
- Individual policy document to be in place in relation to each department within the big umbrella of DoES.

**Project level**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Critical Success Factor</th>
<th>Description</th>
<th>Actions relating to PPP Procurement Steps within the Capital Appraisal Guidelines</th>
<th>PPP Procurement Steps within the Capital Appraisal Guidelines</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Integrate Sustainability into the PPP Environment</td>
<td>Develop overall Sustainability Policy for PPP educational building projects in line with DoES overall Sustainability Strategy</td>
<td>This means streamlining the sustainability development standards to bring together stakeholders, design, construction &amp;operation EU standards, project strategy and research and development at the project appraisal stage.</td>
<td>Appraisal Stage</td>
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<th><strong>2</strong></th>
<th><strong>3</strong></th>
<th><strong>4</strong></th>
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<tbody>
<tr>
<td></td>
<td>Appropriate resources allocated for the project.</td>
<td>Awareness and know-how of sustainability</td>
<td>Identifying needs of the project in hand and allocate appropriate resources that would facilitate sustainability inclusion and implementation at the project appraisal stage step 3. (Approval to proceed (if significant staff resources involved, I detail appraisal stage).)</td>
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<tr>
<td></td>
<td>Draw a Practical Framework for deriving the criteria to be included in OS. Thus, developing OS that addresses and ensures</td>
<td>Critically outline and align the various PPP projects stages with the sustainability requirements of the project. Lay</td>
<td>Integrate sustainability into the priorities of the project, clarify grey-areas. Clearly identify Social, Environmental and Economic</td>
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<td>Planning Stage</td>
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<td>Stage</td>
<td>Task</td>
<td>Details</td>
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<td>5</td>
<td>Develop the contract documents to include sustainability parameters to be reflected in the award criteria.</td>
<td>Identify the specific Social, Environmental, Economic sustainability parameters and allocate them appropriately to public and private partnership. Setting award criteria which clearly identifies the weightage for incorporating bids with sustainable development criteria to ensure the inclusion and implementation of sustainability on the project in hand.</td>
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<tr>
<td>6</td>
<td>Develop Strong/Stringent Evaluation procedures in relation to sustainability inclusion.</td>
<td>Evaluate project with specific social, environmental &amp; economic criteria to ensure that inputs meet the output requirements. The Social, Environmental and Economic sustainability criteria as derived to be used as basis for the evaluation of outputs and linking performance to payments.</td>
<td></td>
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<tr>
<td>6a</td>
<td>Review to be carried out after the project is constructed.</td>
<td>To find any shortfall in the process/policy in relation to sustainability requirement. Lesson learned to be used for further PPP projects to be implemented.</td>
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<td>Planning stage Step 8 (Compile Output Specifications and Public Sector Benchmark (PSB))</td>
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<th>Implementation Stage</th>
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<tr>
<td>Completion of Implementation stage.</td>
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</tr>
<tr>
<td></td>
<td>Develop Strong/Stringent Monitoring procedures for the project with Feedback Control</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>7</td>
<td>Mid-term review to be carried out after the project is operational.</td>
</tr>
<tr>
<td>7a</td>
<td>Final review of the project to capture lessons learned. Review the entire process to document the shortfalls in relation to sustainability implementation. Review the PPP policy if need be for delivering PPP by integrating lessons learned to reflect along with other areas the shortfalls captured in relation to aspects of sustainability. Integrate and update the current policy to reflect learning outcomes. (Repeat Step 1 where Necessary to Broaden Scope)</td>
</tr>
</tbody>
</table>
7.4 Testing Procedure

The previous chapter showed that outcomes in relation to sustainability inclusion on a PPP project are affected by three main core attributes: Innovation, RT and VfM. Through analysis of the case study projects and the literature review a step-by-step guide in the form of a conceptual process model has been developed which clearly identifies the various steps to be taken in implementing and successfully achieving sustainability on a project. There are 8 steps in this conceptual process model which will be tested to establish the construct validity, the internal validity, the credibility, the external validity, the transferability and the reliability of the findings.

In relation to the factors proposed in the model, there is the need to test and examine it in order to comment on the workability on other PPP projects. This was to identify the extent to which the model could meet the research goals. In line with this a group of participants were selected based on their willingness and availability and included amongst others, professional from both the public and private sector who were involved in the implementation of PPP projects. A questionnaire was provided along with the draft conceptual model for the respondent to comment and their responses were recorded in the form of an interview (refer Appendix 5). They were to comment on the conceptual process model and provide inputs on what they think of each of the processes and procedures. A focus group approach was to be used to validate the model however this was not possible due to respondent’s availability and time restrictions.

It has been established that there are no single one fit solutions for including sustainability, as every project is unique. Hence no single solution will fit all, this model helps in finding specific requirements and solutions specific to each project buy deriving at the requirements, and thus catering to the specific needs of every project. The questionnaire comments culminated in a number of responses that were used to show the
extent to which the model could be used as basis for conducting PPP projects and meeting the overall research goal.

The proposed model however could not be assessed quantitatively as the number of case studies and the respective respondents to derive at this conclusion was limited and subject to availability. Nonetheless the findings provide a starting point for future works.

7.5 Test Headings

In order to test the proposed model, there is the need to conduct a critical review and analysis of the different elements of validity, credibility, transferability and reliability.

7.5.1 Validity:

Validity is defined as the ability of the measuring instrument to measure what was intended (Zikmund, W. 1997). It also refers to the use of a logical framework for establishing proper measures to present factually sound results (Yin, R. 2003). Thus, it is the study of the use of proper methods for providing a way of classifying and analysing things within the context of a particular research or study activity.

7.5.1.1 Construct Validity

Construct validity has been explained in detail in chapter 2 section 2.4.7.1. As mentioned in this section, Construct validity involves the acceptance of a set of operations as an adequate definition of what needs to be measured.

Evidence was collected from multiple sources to attain construct validity within the research design. Existing journals, reports and documents in the public domain was used to establish a background to PPP. Interviews were carried out on case study projects from the private and public sectors. Specific documents and reports directly associated with the respective cases were reviewed and the findings cross referenced with interviews.

Cross referencing has helped in delivering main source of evidence in relation to developing the research question. The research questions helped in developing the three
propositions which were tested to revert back to the research question. The propositions used in the case studies helped in developing the case study database. The case study database was then used to prepare the case study report. The report comprises of individual cases and cross case analysis.

To further add to the validity of the report produced, interview data transcribed were reviewed by the respective respondents to verify its contents. Subsequently their comments on the final report were documented and reviewed to ensure that the interpretation of the data and conclusions made had avoided the elements of observer error and bias. The amendments requested were cross checked with interview recordings and documents to discard any participant’s error and bias before making changes to the report.

7.5.1.2 Internal Validity

Internal validity has been explained in detail in chapter 2 section 2.4.7.2. Internal validity helps in establishing a relationship that exists when specific set of circumstances cause an outcome. In this research, the effectiveness of sustainability implementation on PPP school projects is being investigated. To test the internal validity of the findings, the previous chapter took a pattern matching approach to establish the pattern of outcomes that occurred on case study projects undertaken. The logic behind each of the findings is outlined in this test.

7.5.1.3 External Validity

External validity has been explained in detail in chapter 2 section 2.4.7.3. External validity is concerned with the ability to generalise beyond the immediate case study. In this research, the external validity will centre on whether or not the results can lead to the assumption that the outcomes of all PPPs can be influenced by the proposed model or is it relating only to the projects studied in this research.
7.5.2 *Credibility*

Credibility refers to whether or not the findings of a particular research can be challenged. This includes the utilization of methods that ensure that the model can be used to conduct research and present the findings in ways that can be accepted by all parties and will be in line with current sustainability requirements and standards.

7.5.3 *Transferability*

Transferability is the ability to generalize the findings and use it in conducting projects similar to the current method. The findings of this research can demonstrate validity for the projects studied, but however the result needs to be tested over a longer period of time across several projects. This will mean the ability of the proposed model to be able to replicate on other PPP educational projects in order to ensure that sustainability is a key part and aspect of the project. This does not fall within the scope of this PhD, as it would require the use of longitudinal study, a number of potential areas of transferability are suggested that could be the subject of investigation by future research.

7.5.4 *Reliability*

Reliability is based on the ability of the model to be utilised in order to present the same results across different projects with different variables. This therefore means that the model will be tested for the ability to present findings that are consistent across different studies and help to ensure that sustainability is included and attained in the best way and form.

7.5.5 *Triangulation*

Triangulation has been explained in detail in chapter 2 section 2.4.7.5. It is been used in this research to establish greater validity and reliability. In this study, data triangulation has been observed throughout the research design. During the initial stage of the research, both documentation and interviews were used to establish the basis for the study as well as to determine a baseline as to how sustainability is viewed within the context of the
PPP. Subsequently during the case studies, documentation, interviews and direct observation were used to collect data.

7.5.6 **Testing of the proposed model**

In this section, the proposed model will be tested for each step and the factors affecting their outcome. As these various steps’ outcome is influenced by a number of CSFs which has been illustrated in Table 7.1. Each CSF will be tested under each step of the model. Where the outcome of a test contradicts the finding, this will be addressed at the end of that section. The final part of this chapter relates to the refinement of the model based on the test finding.

**Step - 1: Integrate Sustainability into the PPP Environment**

Following outcomes were derived from interviews carried out, literature review and analysis of case study project outcomes in relation to Step 1 as per Table 7.2.

- To develop and establish long term strategy at top level in the form of a policy in relation to sustainability
- Development of a strong policy at strategic level will communicate the seriousness of the organization in relation to sustainability implementation and will give strong direction for sustainability inclusion at project level.
Table 7.2: Test of Step 1 findings.

<table>
<thead>
<tr>
<th>Validity Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construct Validity</strong></td>
<td>Data gathered, documented and reviewed from interviews with key users have raised similar issues in relation to sustainability inclusion. Project outcomes, structured review of documentation and interviews conducted have all followed a consistent format throughout which have provided triangulation of data. The requirement of a PPP Strategy at the top level was the most important requirement established, thus achieving validity.</td>
</tr>
<tr>
<td><strong>Internal Validity</strong></td>
<td>There was a pattern match between the two case study bundles as the extend of sustainability inclusion was in piecemeal. The conclusion reached is that there was not strong policy on sustainability in place which did not give clear direction to the private sector ultimately leading to difference in outcomes. In conclusion the Authority must first develop the policy giving clear direction to private sector. This strong link was missing therefore has internal validity.</td>
</tr>
</tbody>
</table>
| **Credibility**      | Other possible causes:  
The existence of top-level policy ensures that sustainability is given a strong approval at the top level. This helps in communicating to the private partners the seriousness of including sustainability in every aspect of the project.  
Not enough thought given to project level policy in all case study projects.  
This has contributed to the effectiveness of sustainability inclusion thus the finding has credibility. |
External Validity  
The research looked at the case study projects and its findings. The findings are related to the case study projects, however by literature review and interviews conducted it was confirmed that no such policy in relation to sustainability existed at top or project level in Sponsoring public sector at the time of case study implementation. Consequently, the policy in relation to sustainability will be a major factor in determining project inputs and outcomes on other projects.

Transferability  
The strategy/policy is common to all activities performed by the organisation. Hence can be easily transferred on different projects.

Reliability  
Gathering of Project Outcome data form Case study projects has highlighted that an overall policy in relation to sustainability was missing at the time the project was implemented. It’s only in 2014 DoES published its strategy and a top-level policy in relation to sustainability. However individual department policies are still not established. All the interviewers agreed that this was a major shortfall in the entire process. This finding is based on factual information rather than opinions, thereby maintaining reliability.
Step - 2: Appropriate resources allocated for the project.

Following outcomes were derived from interviews carried out, literature review and analysis of case study project outcomes in relation to Step 2.

- Project allocated with appropriate manpower with the know-how of sustainability topic.
- Success of the project is greatly dependent on the expertise of the people involved and their attitudes towards implementation of sustainability which is greatly influenced by the organisation and its commitments towards sustainability implementation.
### Table 7.3: Test of Step 2 findings.

<table>
<thead>
<tr>
<th>Construct validity</th>
<th>The information gathered from interviews, literature review and documentation all prove the importance of appropriate resources allocated for implementing and integrating sustainability into PPP environment. Different sources provide triangulation of data. Allocation of appreciate resources is also linked to the overall sustainability policy. If there is a policy in place then the resource will be allocated based on this requirement and the knowledge and know-how of the subject. Standard consistent format followed throughout. Existence of an overall strategy that transpires into a policy for implementation will greatly benefit appropriate resource allocation on a project. Thus, achieving construct validity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal validity</td>
<td>Case study bundle projects 1 &amp; 2 in relation to sustainability inclusion according to all respondents was aspirational, the OS did not interpret the requirements in an explicit criterion, however some criteria were very explicit for e.g. Energy requirements. Moreover, all participants interviewed agreed that sustainability is not just energy efficiency requirement, but is only part of it. Thus, it depends on the resource allocated and their knowledge in this field to translate it to the projects. This clearly shows the link between sustainability inclusion and appropriate resource allocation. The finding has internal validity.</td>
</tr>
<tr>
<td>Quality</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>Credibility</td>
<td>The credibility of a policy to translate into a project is greatly dependent on the expertise of the people involved and their approach towards implementation of sustainability which is greatly influenced by the organisation and its commitments towards sustainability implementation. Not enough thought given to the project at inception due to lack of policy which links to appropriate resource allocation. The finding therefore has credibility.</td>
</tr>
<tr>
<td>External Validity</td>
<td>The case study project is limited to two case study bundle projects. Thus, these findings are related to these projects only and shows link between policy and appropriate resource allocation.</td>
</tr>
<tr>
<td>Transferability</td>
<td>The resources are asset to an organisation. The knowledge gained on projects can be transferred to other projects easily by appointing expert resources with the know-how and knowledge of sustainability.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Gathering of project outcome data is based on factual information gathered from project documents which were crosschecked with the interview respondent from both private and public sector, thereby maintaining reliability.</td>
</tr>
</tbody>
</table>
Step 3: Develop Action Plan for Sustainable PPP schools building project incorporating & identifying key sustainable goals and objectives specific to the project.

Following outcomes were derived from interviews carried out, literature review and analysis of case study project outcomes in relation to Step 4.

- Identifying and incorporating project specific goals and objectives based on the overall strategy and policy in place. Developing action plan based on the project specific goals and objectives for sustainable PPP school projects.

- The action plan should conceptualize, act and plan within the context of sustainability

- The action plan will clearly identify the social, environmental & economic requirements and criteria relating to the project based on the objectives set for the project.

- The project action plan should clearly identify the sustainability inclusion responsibility in relation to social, environmental and economic of the PPP project in hand.

- Clearly identifying the public, private responsibilities in relation to sustainability goals and objectives, thus establishing a partnership which works for both the parties.
Table 7.4: Test of Step 3 findings.

<table>
<thead>
<tr>
<th>Construct validity</th>
<th>The literature review, interviews and case study carried out identified that an action plan needs to be in place which highlights the sustainability requirements specific to the project. The action plan can be done to conceptualise, act and plan within the parameters set by the project for sustainability inclusion. It should clearly identify the social, environmental and economic goals and objectives in relation to the project. Hence relates back to the policy and appropriate resource allocation of the project. Thus, achieves construct validity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal validity</td>
<td>Case study bundle projects 1 &amp;2 in relation to sustainability inclusion according to all respondents was aspirational, the OS did not interpret the requirements in an explicit criterion, however some criteria were very explicit for e.g. Energy requirements. Moreover, all participants interviewed agreed that sustainability is not just energy efficiency requirement, but is only part of it. Thus, it depends on project specific action plan to derive the various sustainability requirements specific to the project in hand. This clearly shows the link between the action plan and sustainability inclusion. Thus, the finding has internal validity.</td>
</tr>
<tr>
<td>Credibility</td>
<td>The case study outcome showed clear connection between the action plan and sustainability inclusion. Respective action plan specific to the project will have to address social,</td>
</tr>
</tbody>
</table>
environmental and economic sustainability goals and objectives specific to the project. The credibility of this will depend on how well they meet the project sustainability requirements. Thus, there is potential for the team members defining the project to do so in a way that will ensure sustainability inclusion specific to the project based on the project goals and objectives thus the finding has credibility.

<table>
<thead>
<tr>
<th>External validity</th>
<th>As this step is generic in nature and needs to be developed at individual project level. It can be used on different projects.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transferability</td>
<td>The findings have demonstrated that every project will have to have a specific action plan, thus will have to be developed specific to the project. However, the process is generic and can be transferred from project to project. This could also have a subjectivity associated as the resource allocated to individual project will be responsible for identifying the specific requirements. This therefore means the ability to transfer the action plan across project will depend on nature of projects. Therefore, to ensure better results, the overall policy will play a greater role in how individual requirements are being procured. Thus, if required can be easily transferred on different projects.</td>
</tr>
</tbody>
</table>
Step - 4: Draw a framework for deriving the criteria from the action plan to be included in OS. Thus, developing OS that addresses and ensures the inclusion of sustainability goals & objectives set for the project.

Following outcomes were derived from interviews carried out, literature review and analysis of case study project outcomes in relation to Step 4.

- Developing OS to capture the essence of sustainability requirements.
- Identifying and incorporate project specific sustainability criteria – Social, Environmental and Economic criteria specific to the project.
- Critically outline and align the various PPP projects stages with the sustainability requirements. Lay out detailed elements of Input and Outputs for various stages of the project in relation to SD requirements.
- Integrate sustainability into the project specifics. Identify and clarify grey-areas.
<table>
<thead>
<tr>
<th>Table 7.5: Test of Step 4 findings.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construct validity</strong></td>
</tr>
<tr>
<td><strong>Internal validity</strong></td>
</tr>
<tr>
<td><strong>Credibility</strong></td>
</tr>
</tbody>
</table>
to the project based on the project goals and objectives thus the finding has credibility.

<table>
<thead>
<tr>
<th>External validity</th>
<th>As this step is generic in nature and needs to be developed at individual project level. It can be used on different projects.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transferability</td>
<td>This is based on the ability of the project team to identify clearly project specific criteria and general criteria. The general criteria can be applied to all PPP projects, however transfer of project specific criteria needs to be assessed for its transferability. This procedure will have to be carried out by competent sustainability professional, thus should allow the opportunity to standardise sustainability criteria that are general in nature and the ones that are project specific. Thus, the transferability will greatly depend on the nature of the project to be implemented.</td>
</tr>
<tr>
<td>Reliability</td>
<td>The reliability of framework depends on the action plan which sets the project specific goals and objectives to formulate project specific sustainability criteria relating to social, environmental and economic sustainability. This has to be project specific and thus its reliability depends on how well it meets the projects overall goals and objectives.</td>
</tr>
</tbody>
</table>
Step - 5: Develop the contract documents to include sustainability parameters to be reflected in the award criteria.

Following outcomes were derived from interviews carried out, literature review and analysis of case study project outcomes in relation to Step 5.

- Develop the contract documents to include sustainability criteria to be reflected in the award criteria.
- Identify the specific Social, Environmental, Economic sustainability criteria and allocate them appropriately to public and private partnership.
- Setting award criteria to reward bids that incorporate sustainability
Table 7.6: Test of Step 5 findings.

<p>| Construct validity | Data gathered, documented and reviewed from interviews with key users have raised and identified similar issues in relation to sustainability inclusion. Contract documents are one of the important documents in a PPP project as the implementation of the requirements laid in this document is legally binding between the project partners. Project outcomes, structured review of documentation and interviews conducted have all followed a consistent format throughout which have provided triangulation of data. If the criteria are clearly outlined in the project document along with its performance requirement in relation to sustainability it will get implemented in the project. This would be based on the requirements of specific projects and might have different connotations and requirements. It might be different but could be representative of the realities of a specific project. Thus, achieves construct validity. |
| Internal validity | There was a pattern match between the two case study bundles. Only those sustainability requirements were fulfilled that were explicitly stated in the contract document. The conclusion reached is that only those requirements will be included with clear criteria for evaluation in the contract document as it gives clear direction to the private sector. In conclusion the Authority must first develop strong evaluation criteria for sustainability inclusion giving clear direction to private sector. This strong link was missing therefore has internal validity. |
| Credibility | Other possible causes: The existence of top-level policy ensures that sustainability is given a strong approval at the top level. This would help develop criteria at project level and communicate to the private partners the seriousness of including sustainability in every aspect of the project. |</p>
<table>
<thead>
<tr>
<th><strong>Not enough thought given to project level policy and associated sustainability criteria in all case study projects. This has contributed to the effectiveness of sustainability inclusion thus the finding has credibility.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External validity</strong></td>
</tr>
<tr>
<td><strong>Transferability</strong></td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
</tr>
</tbody>
</table>

Following outcomes were derived from interviews carried out, literature review and analysis of case study project outcomes in relation to Step 6.

- Evaluate project process and ensure that inputs and outputs are met.
- The social, environmental and economic sustainability criteria as derived to be used as basis for the evaluation of outputs and linking performance to payments.
Table 7.7: Test of Step 6 findings.

<table>
<thead>
<tr>
<th>Validity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct validity</td>
<td>It was identified in literature review that evaluation procedures of a project bring control and helps in ensuring the project outcomes are met, especially in a project which has a long-term contract. This was further cross checked and was agreed by all the interviewees from private and public sector. Hence provided triangulation of data, thus achieves construct validity.</td>
</tr>
<tr>
<td>Internal Validity</td>
<td>There was a pattern match between the two case study bundles as the extent of sustainability inclusion was limited to the criteria included in the contract documents. This was further confirmed by the interviewers. The conclusion reached is that there were no strong criteria with weightage allocated on the projects in relation to sustainability. All of the interviewee commented that SB2 bundle saw more sustainability inclusion parameters due to the weightage to technical was more on this bundle (70/30). This strong link has proved thus has internal validity.</td>
</tr>
<tr>
<td>Credibility</td>
<td>Other possible causes: The existence of strong project specific criteria can ensure that sustainability is given a strong approval by Authority. This helps in communicating to the private partners the seriousness of including sustainability measures in every aspect of the project.</td>
</tr>
<tr>
<td>Not enough thought was given to project level criteria in relation to sustainability in all case study projects. This has contributed to the effectiveness of sustainability inclusion thus the finding has credibility.</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>External validity</strong></td>
<td>The research looked at the case study projects and its findings. The findings are related to the case study projects, however by literature review and interviews conducted it was confirmed that there were limited sustainability criteria existed on the case study projects. Consequently, the policy in relation to sustainability will pay a major role in deriving these criteria and thus would be a major factor in determining project inputs on other projects.</td>
</tr>
<tr>
<td><strong>Transferability</strong></td>
<td>The evaluation procedure followed on PPP projects is clearly stated in the contract. As long as this is not dependent or limited to the resource allocated and their interpretation of the topic and has clear and strong criteria. The procedure followed to achieve this can be easily transferred.</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Gathering of Project Outcome data form Case study projects has highlighted that the evaluation process is the most important step in relation to sustainability inclusion. All the interviewers agreed that this was not geared to include sustainability criteria in an explicit way and was a major shortfall in the entire process. This finding is based on factual information rather than opinions, thereby maintaining reliability.</td>
</tr>
</tbody>
</table>
Step - 7: Develop Strong/Stringent Monitoring procedures for the project with Feedback Control

Following outcomes were derived from interviews carried out, literature review and analysis of case study project outcomes in relation to Step 7.

- Monitor project to ensure that outputs are met.
- The social, environmental and economic sustainability criteria as derived with performance requirement criteria need to be monitored throughout the project period thus linking performance to payments.
Table 7.8: Test of Step 7 findings.

377


<table>
<thead>
<tr>
<th><strong>External validity</strong></th>
<th>The research looked at the case study projects and its findings. The findings are related to the case study projects, however by literature review and interviews conducted it was confirmed that there were limited sustainability criteria implemented on the case study projects. Consequently, the policy in relation to sustainability will pay a major role in deriving these criteria and their performance requirements thus would be a major factor in determining project inputs on other projects.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transferability</strong></td>
<td>The monitoring procedure followed on PPP projects is clearly stated in the contract and is dependent on the strong policy and evaluation procedure and its output requirements. The procedure followed to achieve this can be easily transferred.</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Gathering of Project Outcome data form Case study projects has highlighted that the monitoring process is as good as the project policy and the evaluation procedure that has been clearly transpired into the contract documents. All the interviewers agreed that this was the case on the case study projects. This finding is based on factual information rather than opinions, thereby maintaining reliability.</td>
</tr>
</tbody>
</table>
Step - 8: Final review of the project to revise the strategy if need be for delivering PPP by integrating lessons learned to reflect along with other areas the shortfalls captured in relation to aspects of sustainability. Integrate and update the current policy to reflect learning outcomes. (Repeat Step 1 where Necessary to Broaden Scope)

Following outcomes were derived from interviews carried out, literature review and analysis of case study project outcomes in relation to Step 8.

- Identify the areas where there are major divergences and redefine the process.
- Critically assess project for sustainability parameters. Develop feedback loop to incorporate change within the existing system where necessary.
Table 7.9: Test of Step 8 findings.

<table>
<thead>
<tr>
<th>Construct validity</th>
<th>The literature review identifies feedback loop as an important aspect of process improvement. It was also seen on the case study projects that lessons learned were documented and used in the implementation of future projects. It was also confirmed by all the interviewee. It is a logical procedure identified in many strategic planning frameworks and procedures. This can be applied and used in ways that would ensure greater results of sustainability inclusion and best practice to be followed on future projects. Thus, achieves construct validity.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal validity</td>
<td>A feedback loop is the most important aspect of any process. All the interviewee accepted this being the most crucial aspect of any process improvement. Thus, have internal validity.</td>
</tr>
<tr>
<td>Credibility</td>
<td>The credibility of this lies in the specific items documented which could bring corrective and better implementation of future projects eliminating the same mistake or exclusion of items being repeated. This could also help in capturing changes to modify and streamline certain outcomes required in a project.</td>
</tr>
<tr>
<td>External validity</td>
<td>The procedure of feedback loop can be generalised on all PPP projects to be implemented, thus achieves external validity.</td>
</tr>
<tr>
<td>Transferability</td>
<td>Transferability of this information depends on specifics of projects. Thus, not all information gathered will be applicable on other project as every project comes with its own dynamics. Thus, the resource plays a major role in this situation as their knowledge and know-how will help in identifying whether it can be transferred on some or all the projects.</td>
</tr>
</tbody>
</table>
implemented by PPP route. However, the procedure of feedback loop is transferable if correctly followed for implementation. Thus, provides a feedback loop which can be of great value.

| Reliability | The feedback loop will help in extracting information that works well and things that don’t work well and need to be amended. This process is very important in relation to improving future PPP projects. This provision supports reliability and helps to attain the best and better results on future PPP projects by implementing projects in ways to cover things that were not included originally. |

### 7.6 Overview of Outcomes of Testing

The outcome of the testing indicates that there are limits that could lead to a wide variation across different projects. However, the generic step-by-step guide will lead a project to achieve its stated potential only if there is a strong policy in place which clearly defines the project of its stated outcomes. Transpiring the requirements on individual projects is again to a certain extend dependent on the involvement of appropriate resources and their expertise in relating the existing policy into the working projects. However, there is an amount of subjectivity related in implementing this process which needs to be managed by a strong policy and appropriate resources.

The inclusion of team members is important to ensure that sustainability and the role of the private and public partners is clearly identified in a given projects. The need for training and sensitization to ensure that all team members and stakeholders and relevant partners under projects are in tune with the requirements of the project in hand. This will mean there is the transferability of the model to project in ways that gains support from all stakeholders. This will help the process in identifying major trends in sustainability.
that will promote better results and strong connections to projects in order to achieve an overall better result. In this entire process, the stakeholder plays an important role in defining the inputs and outputs to ensure convergence of inputs with outputs. This will help to guide and lead projects in ways that would achieve better results in relation to sustainability. This would bring together different aspects and ensure that projects are meeting their core goals and objectives.

Finally, there must be a stringent evaluation and monitoring procedure in relation to sustainability matters. A sustainability checklist should also be developed specific to project undertaken which should include social, environmental and economic criteria specific to project. The delivery of sustainability needs to be monitored to achieve stated standards and objectives are strong across board. This would lead to better results and ensure that stated goals have been achieved on the projects undertaken.

7.7 Research to date

This research aims to develop a conceptual model that will be used to identify strategies which will lead to greater effectiveness of sustainability on future PPP projects. A step by step guide has been developed in the form of a process model to achieve this aim. Figure 7.11 illustrates the progress of the research to this point and shows that, through the literature review, the aim of the first five objectives have been achieved which has resulted in the proposed framework for the model.
7.8 Summary of research to date

The research to date has been concerned with gathering together the existing literature relating to the topic with the aim of focusing the research question and establishing a framework for the development of the conceptual model. The specific objectives of this part of the research were to:

- develop an understanding of sustainability requirements in a PPP project environment;
- carry out a critical appraisal of sustainability requirements implemented to date on educational school building projects procured by PPP route in Ireland;
- establish the challenges facing the key players within the public sector in the inclusion of sustainability on a PPP schools project;
• establish a means by which these challenges can be addressed

• Propose a conceptual model to be used as a basis for further investigation of

a means of improving effectiveness of inclusion of sustainability on PPP.

This part of the research was divided into six chapters. Chapters 3, 4, 5 and 6 addressed the first four objectives. Chapter 3 identified the challenges that are arising and examined the options for facing these challenges. Chapter 5 & 6 concentrated to identify the link between the three processes, Value for money, risk transfer and innovation (as input) and sustainable project outcomes (as an output). In chapter 7, the framework for the model was developed and the means by which it would be used was outlined.

The primary research – focusing on the development of a conceptual model that will be used to identify strategies which will lead to greater efficiency and effectiveness of sustainability inclusion on future PPP has begun with the work done in chapters 3, 4, 5 & 6. Through the investigation of the potential influence of the three processes on project outcomes the following chapters 6&7 have further developed to increase the effectiveness of sustainability inclusion on PPP schools project and refine the model.
Figure: 7.11 Mind map of chapter 7
8.0 Introduction

On 29 September 2005 the Minister for Education and Science, Mary Hanafin T.D., announced plans to provide one of the largest PPP schools programme, consisting of 23 new post-primary and 4 new primary schools, through PPP procurement route. The projects targeted for delivery involved new schools in rapidly developing areas, the replacement of existing schools and new accommodation for schools formed by the amalgamation of existing schools. In 2008, when this research began, none of the 2005 PPP programme projects were completed. Only the 4 pilot school projects implemented by PPP were complete and operational. Through this research, it is intended to set out and develop a conceptual model that could be used to increase the effectiveness of sustainability inclusion in the use of PPP in Ireland. A conceptual model proposed suggests a step-by-step guide to achieve the inclusion of sustainability, that influences the inputs in a PPP process to reflect the required outputs.

This thesis examined whether the PPP procurement route supports opportunities for the actors involved in the process to implement sustainability in its entirety. It then expands on the three pillars of sustainability and its relationship to the key PPP processes. The issues that have been discussed are primarily concerned with sustainability implementation on PPP projects. In particular it has sought to answer the research question.

This final chapter aims to summarise the key findings with reference to the specific research objectives that were presented in chapter 1. Issues that have to be taken into
consideration if sustainability is to be implemented on projects, have been elaborated upon. It then concludes with the development of a conceptual model in the form of a step-by-step guide, that can be used to achieve greater efficiency and effectiveness of sustainability inclusion in relation to the three pillars in a PPP project environment. Consideration is given to the limitations of the chosen research strategy as well as the assumptions made. This chapter is concluded by a brief discussion on the contribution that the research has made and has elaborated recommendations for further research.

8.1 Research objectives

In order to summarise the thesis and draw final conclusions, it is first appropriate to reiterate the research objectives as presented in chapter 1:

1. To define the concept of PPP as it applies to the construction industry context.
2. To identify & examine key areas within sustainability theory which are pertinent to PPP project arrangements.
3. To carry out a critical appraisal of the use of sustainability in the design of PPP provision of educational school facilities in Ireland.
4. To review current EU regulation and policies with respect to sustainability in the context of PPP projects.
5. To develop a model that will ensure the inclusion of sustainability as a key factor in design development of a PPP project.
6. To carry out field research to test the model.
7. To refine the model to increase the effectiveness of sustainability on PPP educational projects.
This thesis has addressed the stated objectives as described. The first two objectives were addressed in chapters 3, 4, and 5. The fifth, sixth and seventh objectives spanned over chapters 6 and 7.

To address Objective 1, a literature review was conducted using data from two distinct sources. Firstly, from published journals, reports, articles and others, and secondly from interviews conducted and observations made. As planned, two refereed academic papers were prepared and presented at the Conseil International du Bâtiment (CIB) and Architectural Engineering Conferences (AECs) in 2009 and 2011 respectively. Contacts were made with construction professionals at these conferences, which helped in creating a list of professionals working on PPP’s and reviewing documents published by them to gather more information in relation to research topic. This further helped in achieving the required outcome in relation to Objective 1, which was to understand the concept of PPP as it relates to the construction industry. This outcome was achieved.

In addressing Objective 2, the existing documentation in relation to identifying the key areas of sustainability theory, which are pertinent to PPP project arrangements, was identified. Such documentation regarding the Irish experience was found to be limited but was supplemented by reports from the PFI experiences of the UK and around the world. From this review, key areas within sustainability theory were identified which were pertinent of PPP procurement, thereby achieving objective 2.

Based on the literature review the challenges facing the public and private sectors were identified and how they would apply to an Irish PPP process was assessed. In turn, these challenges were analysed and it was found that they manifested themselves through one of three factors, namely: RT, VfM and Innovation and the relationship formed by the partnership. Identifying these challenges resulted in the achievement of objective 3.
In addressing objective 4, outcomes required to address the current EU regulations and policies with respect to sustainability in the context of PPP projects were identified and listed. This helped in identifying the current environment in which the PPPs are implemented and the guiding legislation that helps in the inclusion of sustainability on current construction projects.

This allowed for a level of understanding which then facilitated the development of a conceptual model. A process approach was adapted in developing this model which allowed identifying the inputs required to achieve the desired outputs. This resulted in the development of the conceptual model in the form of a step-by-step guide and was fulfilled in the achievement of objective 5.

The development of the conceptual model helped in establishing a research strategy for the types of data required and the means by which this data will be gathered, processed, analysed and tested. This then allowed for the gathering of the required data to further refine the model. Objective 6 concerned the actual field research, involving the data gathering, data processing, data analysis, establishment of findings and the testing of these findings to establish validity, reliability, credibility and transferability. This resulted in the achievement of objective 6.

The analysis and testing process continued until late February 2015 by which time the model had been verified and refined, thereby achieving objective 7.

8.2 Summary and conclusions

In this section of the thesis, discussions and findings are summarised to draw the final conclusions against each objective.
8.2.1 Objective 1: The concept of Public Private Partnerships

Chapter 1 presented the context for this research and also identified the wide spread attention given to PPPs. In spite of the considerable interest that it attracts, the concept of PPP is still evolving. However, PPPs are established to collaborate between operators, designers and contractors that lead to solutions required by prospective clients. Chapter 3 presented an extensive review of the available literature on PPPs, supported by information gathered from many other sources as described in research methodology. Furthermore, the various categories of PPPs were defined and explained. This highlighted the various types of PPP available and their relationship with the contractual arrangements.

The literature showed that the fundamental idea behind the PPP procurement route has existed for a very long time. The reasons for public sector initiating PPP projects were also presented, the high-level issue such as off-balance sheet financing was also discussed and its influence on the public sector borrowing requirements, alongside the whole life cycle costing. Particular attention was given to the three main criteria of PPP, VfM, RT and Innovation. The context of Innovation in a PPP project was researched along with the process of RT from the public sector to the private sector. Particular attention was also given to the VfM assessment from a public sector perspective. The relationship between the three criteria and how they relate to one another in a PPP context was explored.

It was concluded that there is no generic PPP model that can be universally applied. The exact form that procurement of a project takes and how it is carried out depends on the legislation, regulations and requirements of the individual project and the jurisdiction in which they are implemented.
8.2.2 **Objective 2: To identify & examine key areas within sustainability theory which are pertinent to PPP project agreement.**

Chapters 3 & 4 reviewed the general literature on PPP & sustainability in order to establish an increased understanding of these two topics and how they govern sustainability within PPPs. Consideration was given to the theoretical origins of the two topics (PPP & sustainability) and to the core principles common to these two topics.

The idea that sustainability inclusion on PPP projects is a positive change was then introduced. The significance of sustainability within a PPP project environment has been established based on the findings from chapters 3 and 4. PPP projects are structured over a long-term concession period; thus, it is essential to ensure that they meet with the sustainability requirements. The PPP projects are based on the partnership formed between the public and private sector; hence it is essential to have a level of certainty and reliability that the partnership will promote sustainability to be implemented on these projects throughout the concession period. This needs to be reflected by the organisations and the people involved in this process.

It has been established that a certain amount of flexibility is required in a PPP project environment, which would promote sustainability inclusion based on knowledge and experience of the private sector. A framework that is able to operate with both the characteristics needs to coexist within the project environment to ensure that a progressive environment is achieved to create a win-win situation for both parties involved.

It was also acknowledged that the term sustainability in many ways is both ambiguous and all-inclusive. The review was then streamlined and particular attention was given to the three pillars of sustainability: Social, Environmental & Economical. A classification
was then introduced that divides the three pillars of sustainability in relation to the three criteria of PPP arrangement namely VfM, RT and Innovation. It was acknowledged that these criteria can generate or shape sustainable output. Subsequently, the view of the process of sustainable activities was seen as more of a controlled chaos. This was followed by an elaboration on the likely origins of the sustainability inclusion in regards to both the sponsoring agency and the SPV. This line of argument was based on the belief that sustainable behaviour could not be understood by looking at profit or growth maximising theories alone. The underlying reasons for sustainability were highlighted, considering both the cost saving and value enhancing aspects. The argument was developed that these two views of sustainable behaviour are intangibly linked to the three criteria and could be either a reaction to current external or internal forces or a result of a proactive approach where the SPV tries to gain advantages for the future. A presentation was then made of inhibitors or ‘hampering’ factors to sustainability, clustered into internal and external factors. This demonstrated that organisations might have the required skills and knowledge to implement sustainability, as well as strong incentives to do so and, yet, choose not to.

Hence the findings enable the assertion that sustainability is co-dependent on VfM, RT, and Innovation in a PPP project environment. Subsequently the findings indicate that the relationship of the co-dependents is complex and multi-dimensional.

8.2.3 Objective 3: To carry out a critical appraisal of the use of sustainability in the design of PPP provisions of educational school facilities in Ireland.

Chapter 5 described the multiple-case study design adopted for studying five PPP school projects on four sites, implemented by the two bundles of school projects SB1 & SB2. The projects were chosen based on the reasoning as provided and identified in research
methodology, chapter 2. This case study gave an extensive inclusion of PPP school projects carried out at that time. Based on this chapter, three areas of interest were singled out as pertinent for the study. The key criteria for the potential success of a PPP project were identified as VfM, RT and Innovation. Theoretical propositions were created, which were subsequently used as templates for data collection and analysis of case study projects.

Chapter 5 details 4 case study projects to identify the extent of sustainability implemented on the schools’ projects in Ireland. The analysis was carried out in two parts. Part I identified the various criteria included on these projects in relation to social, environmental and economic sustainability. After identifying these criteria, analysis was carried out in Part II based on the relationship to the three criteria of PPP, VfM, RT and Innovation. Thus, the link between the two topics were identified and established.

The case study also supported the contention that VfM, RT and Innovation lie at the very core of PPP projects. The importance of methodically implementing sustainability from identification to mitigation and reporting on a PPP project was also clearly evident. Sustainability in its own way was a result of measures taken to pool knowledge within the teams, drawing selectively on outside expertise where necessary. It was concluded that transparency in the allocation of the sustainability is absolutely necessary for the success of a PPP project.

A school building is a social facility, thus needing to be robust in meeting the specification determined within the contract for the concession period and at the time of hand back. This filters down further to the design, materials and maintenance that go into the facility. The Sponsoring Authority also needs to be committed to ensure that partnership and the community at large are upheld.
8.2.4 Objective 4: To review current EU Regulation and Policies with respect to sustainability in the context of PPP projects.

Objective four was initially dealt with in chapters 3 and 4, albeit implicitly. These presented the reasons, sources and drivers that might motivate an organisation to implement sustainability.

It followed from the presentation of PPP in chapter 3 that there is opportunity for the actors on the project to establish procedures that lend support to the stated success factors of implementing sustainability. For example, the use of output specifications and service level agreements does, in theory, provide private actors with increased opportunity to design away from past practices and to use their own skill and experience in order to provide efficient solutions to the problem at hand. Furthermore, the usual composition of the project companies, with organisations drawn from construction companies and/or operators, would suggest that it could act as an ‘initiated’ client and would support sustainability, as it is in the interest of the private sector due to the long-term arrangement. Further support was found in chapter 5, where the findings from the multiple-case study are presented. The four case studies presented showed several of the features from the established sustainability success factors, in particular, early commitment to the sustainability from an authority perspective, would provide a commitment to the private sector for successfully including and implementing sustainability on PPP projects.

Proven inhibitors to sustainability were also highlighted in chapter 5. The case studies showed that several aspects of the projects revealed sustainability hampering factors. The ways in which the contracts are designed allow for the financiers and the equity providers
to influence the contractual agreements. Not surprisingly, these actors will as far as possible favour their own interests and their opinions on the suitability of the proposed solutions might well differ to those of the implementing organisation. Two of the inhibitors, clearly contradicting the notion of PPP projects nourishing sustainability inclusion, are particularly apparent: ‘excessive perceived risks’ and ‘costs too high’ in comparison to traditional solutions. These are inherent in the cost and the time restraints incorporated in construction contracts and the associated risks. So, whilst guaranteed price and completion date are two clear benefits, at least seen from the public sector client’s perspective, it is also the reason that considerable caution is taken with the development of sustainability ideas from the private sector. These, however, get implemented if it is precisely identified as a requirement in the output specification and has a strong policy and legislation to back it up.

8.2.5 Objective 5: To develop a model that will ensure the inclusion of sustainability as a key factor in design development of a PPP project.

Background information in relation to objective five was initially dealt within chapters 3, 4 and 5. These presented the reasons, sources and drivers that are essential to the inclusion of sustainability in relation to PPP project environment. These formed the basis of developing the model. A conceptual model in the form of step-by-step guide was developed in chapter 7 which incorporated motivation of an organisation to implement sustainability in the procurement of PPP projects.

This is developed based on the internal and external factors. The conceptual model is designed to: identify the key processes, identify their relationships and interactions and identify the CSFs that govern sustainability. The model is a qualitative representation of
how the various processes and factors operate in an operational PPP project. With this approach the sponsoring authority is able to implement sustainability measures that are pertinent to individual projects, by identifying key stages which require additional measures and attention to avoid the balance of the three-pillar sustainability being compromised. This has been addressed by identifying the CSF in relation to sustainability. A further improvement to this model could be achieved by shifting from a qualitative representative to a quantitative at individual project level by identifying and including criteria pertaining to the nature of individual projects.

This study has provided a clearer definition of sustainability within the context of a PPP project environment. Sustainability inclusion can also help to monitor the management of a project by the public sector or sponsoring agency to track the changes that occur throughout the project life cycle.

The CSFs for sustainability presented in this study can be utilised as a framework to form strategies for implementing and incorporating sustainability from public partner’s perspective. By encompassing these factors as criteria, the sustainability of the PPP project can be constantly reassessed. While these factors are currently qualitative criteria as opposed to quantitative ones, a higher dependency on the people involved in the project is certain. Thus, the CSFs can be used to design and implement the demands of delivering a successful and sustainable PPP project.

8.2.6 Objective 6: To carry out field research to test the model and to refine the model to increase the effectiveness of sustainability on PPP educational projects.
Chapter 7 dealt with the testing of the developed model and the fulfilment of objective 6. It tested the findings for validity, credibility, transferability and reliability. It concluded that there is a link between the three-pillar sustainability model and the three criteria of a PPP project environment.

Chapter 6 presented the findings from the case study with reference to the preceding theory. Support was found for the first proposition, which stated that sustainability inclusion on PPP projects is dependent on relationship between VfM, RT and Innovation. In particular the projects showed proof of relationship between the three main criteria. Furthermore, the findings endorse the importance of the three main criteria and identified that committing to these criteria at a very early stage would extensively benefit the project in hand.

Support was also found for the second proposition, which stated that inclusion of sustainability associated with a degree of flexibility within PPP procurement to which the project has to conform was made explicit. The findings indicate that it is advantageous for both public and private sector actors to have dealt with and reached consensus over these matters, from the very beginning of the projects. The limited scope for changes in the construction contract also highlighted the importance and timing of introduction of the operator to jointly work with the design and construction teams, were also noted.

It can be concluded from chapters 3, 4, 5 and 6 that a key issue for three-pillar sustainability inclusion on a PPP project environment relates to RT, VfM and Innovation. This then takes us to the third preposition: in a PPP project trade-offs occur between social, environmental and economic sustainability in relation to the RT, VfM and Innovation. The organisation’s ability to make rational calculations about inclusion of
sustainability is, inevitably, highly variable and dependent upon factors such as available and reliable information, sufficient time to respond, degree of inclination and awareness of constraints and available facilitators within the PPP project team.

The symbiotic relationship between PPP and sustainability describes the association between the two. Furthermore, both these characteristics are closely related to the core criteria of VFM, RT and Innovation. The interrelationship between the three elements has also been presented. Hence this confirms that the notion implied by propositions 1, 2 and 3 to be true and valid.

**8.2.7 Final discussion**

The aim of this research was to develop and verify a conceptual model which will be used to achieve greater inclusion of sustainability in future PPP projects. This thesis is an account of how this aim was addressed. The research has been structured into two parts. The first part, comprising chapters 3 to 6, was exploratory and it investigated the first four of seven objectives. The result of this part was to develop a conceptual model for greater inclusion of sustainability on PPP projects. The second part is the testing and verification of the model with guidance on its use as a means of improving inclusion of sustainability of future PPP projects.

Chapter 2 set out the research methodology, clearly identifying three propositions that would be tested through the use of a multi–case embedded design case study. In chapter 5, the data gathering process was recorded and the data gathered was used to address the first two propositions. Chapter 6 is devoted to testing the three propositions, the result of which showed that there was strong evidence of trade-offs that occur between social,
environmental and economic sustainability in a PPP project environment which had a significant influence on the project outcome.

Chapter 7 further tested these findings for validity, credibility, transferability and reliability. It concluded that there is a link between the three core criteria of PPP project relating it to project outcomes. It also concluded that the combination of a number of inputs can result in outcomes that may be relevant to a specific project. Having arrived at these conclusions, the original model in the form of a step-by-step guide was refined and made ready for use. This final chapter has outlined the implications of these findings; outlining the exclusions, limitations, constraints, and reservations that apply and has set out a research agenda that will build on this research into the future.

8.3 **Original contribution to knowledge**

The original contributions to the existing body of knowledge in this research are as follows:

8.3.1 Identified and documented the link between sustainability and PPP process.

8.3.2 Identified and documented sustainability criteria: social, environmental and economic criteria of a PPP project at strategic and project level.

8.3.3 Four documented case studies.

8.3.4 CSFs for implementation of sustainability on PPP projects.

**Main contribution to Knowledge:**

8.3.5 The development of a conceptual model to guide the implementation of sustainability in a PPP project environment by a Step-by-step guide to achieve sustainability on a PPP school Project at strategic & project level.
8.3.1 Identified and documented the link between Sustainability and PPP process

The concept of PPP has not been well defined in the construction discipline as indicated previously in Chapter 3. Thus, this research has attempted in establishing and quantifying sustainability in relation to PPP by identifying the link between sustainability and PPP process. Subsequently there have been numerous indications in both the government publication and research journals for the need of greater inclusion of sustainable development practices in projects procured by PPP route. However, the inconclusiveness, surrounding sustainability remains and thus this study has presented a conceptual approach of defining sustainability within the context of the PPP procurement. While the idea presented in this thesis remains a conceptual one, it provides the basis for transforming the conceptual theory into one that is theoretical. Hence with this initiation, the understanding of sustainability and defining the boundaries in which it operates allows for optimum utilisation of the characteristic to be reflected within the PPP procurement.

8.3.2 Identified and documented Sustainability criteria: Social, Environmental and Economic criteria of a PPP project at strategic and project level;

The sustainability criteria were extracted based on the concepts described in great length in Chapters 3 and 4. The social, environmental and economic criteria documented are based on the principals of PPP and sustainability. The criteria depict the complex relationship that exists within sustainability implementation of construction projects by PPP procurement. The representation can be further enhanced through means of qualitative and quantitative techniques. As a result of this the precision in measuring and monitoring the impact of change due to various factors internal and external to the
project environment can be captured. Thus, the criteria identified in this study provides the right starting point for inclusion of sustainability on projects procured by the PPP route.

8.3.3 Four Documented Case Studies

This research documents five PPP School projects on four sites as the four case study projects which have been the main source of information and testing mechanism for this research. These case studies as documented and presented in chapter 5 contain a richness of data pertaining to inclusion of sustainability on PPP school projects in Ireland. The conceptual ideas are supported by the documented evidence as identified using the case studies allowing a platform to test these ideas, thus contributing to the validation process in this research. These case studies as documented also add to the existing body of knowledge of case studies. Furthermore, these case studies also provide the avenue for new and future research pertaining to sustainability inclusion on projects procured through PPP.

8.3.4 CSFs for implementation of Sustainability on PPP projects

CSFs that are appropriate to the requirements and success of a project will aim to fulfil the stated project objectives. Thus, they would help the end user to identify and improve what is being monitored or measured. While the core CSFs for inclusion of sustainability in a PPP project environment have been identified based on the PPP ethos and concept, it has only initiated such a move in identifying the CSFs for inclusion of sustainability on PPP projects based on literature reviews of links identified as common to the two topics and the four case studies conducted from the public sector perspective.
A step-by-step guide in the form of a process model has been proposed as a guide to the sponsoring authority to minimise unfavourable outcomes in relation to sustainability inclusion, thus promoting efficient use of the public funds.

8.3.5 **Main contribution to knowledge: Step-by-step guide to using the model to achieve sustainability on a PPP school project at strategic & project level.**

The step-by-step guide is proposed based on the PPP concepts described in great length in Chapter 3. Chapter 3 identified the challenges arising and examined the options for facing these challenges. Chapter 5 and 6 concentrated to identify the link between the three processes, VfM, RT and Innovation (as input) and sustainable project outcomes (as an output). In chapter 7, the framework for the model was developed and the means by which it would be used was outlined.

This research has aimed to identify the similarities and differences between the two main topics PPP & sustainability. It relates to the framework currently used for implementing PPP projects and the complex relationship that exists for inclusion of sustainability. The conceptual model in a step-by-step guide proposed is aimed to be used to improve the implementation of sustainable development practices incorporated in educational PPP school projects in Ireland at strategic & project level. Thus, this model provides the right starting point for inclusion of sustainability on projects procured through the PPP route.

8.4 **Potential benefit and applicability of this research**

The research outputs are based on PPP school projects implemented by public partners (sponsoring authority). These outputs have been listed as part of the contribution to the body of knowledge in chapters 5 and 6. The application of the outputs is thus seen
practical and suitable for the PPP industry in Ireland as it addresses some of the pertaining criticisms raised in the literature. As noted in Chapter 1, the potential benefit and applicability of this research is summarised with reference to each stakeholder group:

- Public sector: sponsoring authority.
- Private sector: service providers.
- School staff and pupils: end users.
- School stakeholders.

8.4.1 Public sector: Sponsoring authority

The research produced a model that will facilitate the early identification of inputs required for achieving greater sustainability inclusion in educational buildings. This will in turn enable the efficient and effective use of PPP models in terms of social, environmental and economical sustainability. It will guide the PPP process to establish the inputs that are necessary if certain project outcomes are to be achieved. Following benefits can be identified for sponsoring authorities:

- It will help in better understanding of implementing sustainability on PPP Projects.
- It will highlight areas in the current PPP process that requires attention in relation to sustainability inclusion.
- It will create more confidence and better understanding in the PPP process. Application of the proposed sustainability model in the form of a step-by-step guide by the sponsoring authority could result in the reduction of unfavourable outcomes, thus promoting efficient use of the public funds.
8.4.2 Private sector: Service providers

Similar benefits will apply to the private sector partners who will now take on the role of service providers. The application of the model will make each stakeholder aware of the issues that prevent themselves and other partners from performing to the maximum benefit of the entire partnership. Such awareness will bring greater effectiveness in the delivery of services in relation to sustainability, thus benefiting from shorter procurement cycles, resulting in reduction of costs. Application of the model in the private sector will highlight all the skills required to put together a successful team for the entire duration of the project, thereby ensuring that the aims of all partners are accomplished.

8.4.3 School users: End users

These include the staff, students of the school and others in the locality that make use of the facility for whatever purpose. This research aims to provide a quality educational facility appropriate to its users’ requirements. Studies have also shown that sustainable buildings improve the ability of students to learn and also positively impact on the productivity of the staff. The role of these people in identifying issues relating to sustainability is a critical factor in the success of any project. The assistance provided by end users in preparation of the output specification will capture most of the issues involving staff needs, i.e. improved quality of school buildings, working and teaching environments of teachers and pupils, and learning environments of students.

8.4.4 School Stakeholders

In Ireland the use of PPP procurement is still in its early stages as the various PPP school bundles to be implemented are still looking for ways to improve the process. Possibly
the most significant benefit to the school stakeholders will be the illustration of the means by which sustainability can be incorporated and managed when the PPP route is chosen to provide a public sector facility. Future stakeholders now have a model that will assist in planning the avoidance of the difficulties that arise in the introduction of sustainable development through PPP and thereby maximise the effectiveness of facilities.

8.5 Recommendations for further work

This section will summarise and propose a research agenda that will take this to the next level as follows:

8.5.1 Short Term

- It is proposed to use this model on new PPPs to be implemented in Ireland. The participants from the public sector who participated in this research are willing to use this model on the new PPP projects. There is also interest in this model from the private sector. It is also proposed that application of the model could be combined with Master of Philosophy (M.Phil.) or Master of Research (M.Res.) level research.

- This tool was developed to incorporate sustainability on PPP school projects and was adequate for purpose for which it was intended, further research is required to develop a robust tool for the measurement of three-pillar sustainability requirements. It is envisaged that this could be combined with further PhD level research and would be conducted in collaboration with experts from both the fields; PPPs and sustainability.
• Similarly, a tool can be developed for the measurement of project outcomes which could be a further PhD research project.

8.5.2 Medium Term

• The sustainability evaluation model submitted as a research output has been validated by the respective case study respondents. This validation is limited to the knowledge and experience of the respondents involved in the project at the time of the study. Conversely the sustainability model is a reflection of the entire project life cycle. Hence an extensive validation of the sustainability model will further improve the true representation of the project life cycle from project appraisal stage to the termination of the concession period. Furthermore, the model currently provides a graphical presentation of the life cycle in seven different stages. By means of incorporating advance qualitative tools, the dynamics of the model can be further enhanced to provide a higher degree of practical representation.

8.5.3 Long Term

• The research had indicated that one of the CSFs for sustainability inclusion identified through the research was people. The exploration of the role of the people involved in the PPP project was not part of the scope. Nevertheless, it is viewed that this factor plays an important and crucial role in delivering sustainability inclusion in PPP procurement. Thus, it is recommended that an assessment of the skills and experience level within the public and private partnership members be explored to ascertain if the right competencies are
acquired by the individuals. In addition, the types of training to enhance the skills and knowledge to meet the challenges in managing and implementing such procurement projects needs to be identified and appropriate modules formulated.

- The above recommendations are envisaged to further improve the outputs of this research and contribute to the existing body of knowledge. The outputs of the future works are perceived to provide a better understanding in approaching and managing PPP projects in relation to sustainability inclusion in Ireland.

This chapter summarises the findings of all the seven chapters and its relation to the set research objectives. It discusses the individual objectives, its findings and summarises to draw the final conclusion against each objective. It further highlights the various original contribution to the existing body of knowledge which is derived from this research. It then summarises the potential benefit and applicability of this research to the public and private partners. It draws the conclusion to the exclusions, limitations, constraints and reservations that this research had in its development and finally concludes with the recommendation for short, medium- and long-term future work.
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### APPENDIX - 1

Global PPP deals by sector and region 1985-2009 (Source: OECD 2014)

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APPENDIX 2: PPPs in Ireland  
Public Private Partnerships and Concession Projects in Ireland  

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APPENDIX 3: As built view of GCSF from PPP SB1
APPENDIX 4: As built aerial impression of PCD from PPP SB1
APPENDIX 5: As built aerial impression of KCS from PPP SB2 (www.athboycs.ie)
APPENDIX 6: Site Plan & aerial impression of ACS from PPP SB2 (www.athboyces.ie)
## APPENDIX 7: CASE STUDY PROTOCOL

### Interview Notes

**Respondent’s Name:**

**Date:**

**Time:**

**Location:**

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**Definition:**

**Public Private Partnership (PPP):** "Innovative methods used by the public sector to contract with the private sector, who bring their capital and their ability to deliver projects on time and to budget, while the public sector retains the responsibility to provide these services to the public in a way that benefits the public and delivers economic development and an improvement in the quality of life’ (United Nations 2008)."

1. In your opinion, how would you describe a PPP educational project in Ireland?  
   **Observations/Notes**

2. In your opinion, what are the benefits/drawbacks of a PPP arrangement in the educational sector?  
   **Observations/Notes**

**Definition:**

**Sustainable development:** "Development which meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN Brundtland Commission Report, 1987).

3. In your opinion, do PPP in educational sector promote sustainable development?  
   Yes/No. If yes please give an example?  
   **Observations/Notes**
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<tr>
<th></th>
<th>In your opinion, is PPP in educational sector <strong>successful in implementing</strong> sustainable development in Ireland? Yes/No. If Yes/No what are the reasons?</th>
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<td>In your opinion, who would you think is <strong>Responsible to Ensure</strong> PPPs in educational sector deliver sustainable development? Public/Private/End user</td>
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<td>In your opinion does the authority (Public sector) have any <strong>power in influencing</strong> sustainable development design principles to the PPPs educational projects?</td>
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<td>Is sustainable development a factor in government PPP decision-making? Yes /No, If no, why?</td>
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<td>Are there any <strong>barriers</strong> preventing PPPs from delivering sustainable development? Yes/No. If yes please list the barriers in your opinion.</td>
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<td>8.</td>
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<td>What <strong>role</strong> does the authority (Public sector) have in <strong>achieving</strong> greater levels of sustainable development in PPP projects?</td>
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<td>Can you give an example in SB1 PPP project that has contributed significantly to sustainable development?</td>
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<td>Can you give an example in SB2 PPP project that has contributed significantly to sustainable development?</td>
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<tr>
<td><strong>12.</strong> In your opinion can PPP procurement be <strong>incentivised</strong> by the authority (Public sector) to deliver sustainable design development of educational buildings? If yes, how?</td>
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<td><strong>13.</strong> In your opinion are the authority (Public sector), the private sector and the End user familiar with the principles of sustainable development?</td>
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<td><strong>14.</strong> In the PPP education sector, what are the biggest <strong>challenges</strong> with regards to sustainable design development in Ireland?</td>
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<td><strong>15.</strong> In your opinion what <strong>improvements</strong> should be made to the PPP process to successfully implement sustainable design development on the PPP educational buildings in Ireland?</td>
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### Assessment I: Case study project name: Sustainability Assessment based on Soc, Env & Eco

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## ASSESSMENT II: Sustainability Assessment based on INNOVATION, RT & VfM

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APPENDIX 8: Sample Case Study Interview Transcribed

Background

AM was involved in SB 1 and SB 2 projects in the capacity of Process Auditor, under the terms of PPP procurement guidelines, which means AM was presented with the steps to be undertaken to bring the process from beginning to contract close. AM had to make sure that all the steps were followed and sufficient consideration was given to each decision making and they were successfully concluded at Project Board and Project Team level. On SB1 AM came in a bit late and was in position when governance document was drawn up. AM also has background of working in Local Authority with responsibility of implementing Sustainable Development on construction building project.

RR explained the purpose of this research and also gave the background and relevant definition used in relation to this research. The definition used for Sustainable Development was the UN Brundtland Commission definition and for PPP was the UN definition.

Question 1:

In your opinion, how would you describe a PPP educational project in Ireland? Is it implementing sustainability in its entirety?

AM: I suppose my observation would be that No, it is placed with in a context where sustainability is only becoming a part of the technical evaluation. The whole concept of sustainability is only growing and transforming within the public sector. It’s growing and making its influence in the PPP project.

Question 2:

In your opinion, what are the benefits/drawbacks of a PPP arrangement in the educational sector that will hinder sustainability?
**AM:** I think it very much depends on what criteria is used to draw in the PPP consortia. PPP consortia will only respond to what is included in Invitation to Tender in the bidding process. It is up to them, at the moment to decide what elements of sustainability they include will attract favourable response from the state. Then again some may take a view of making a submission of strong sustainability proposal as a way of best practice. The best practice is put forward which will be most attractive option for the state.

**RR:** Do we have any legislation in place for implementing sustainability on PPP projects?

**AM:** I am a little bit out of loop on this topic, as I understand sustainability principles inform all of our legislation because it is a requirement based on European legislation. I understand for quite a number of year’s sustainability and environmental concerns have informed our legislation.

**RR:** When sustainability is divided into social environmental, and economic criteria. Do you think the social sustainability aspect is little bit neglected as compared to environmental and economic sustainability?

**AM:** I think so my general observation first comes in technical - environmental sustainability followed by economic sustainability and then social sustainability. I think it is coming; there is growing awareness of integration of the three pillars. It is an integrated process.

**Question 3:**

*In your opinion, do PPP in educational sector promote sustainable development? Yes/No.*

**If yes please give an example?**

**AM:** Yes, because there is long term context, the best policy principle at that time informs the thinking around PPPs. That's not to say the best policy principles at that time can make voice to sustainability. But I think an effort is made to ensure and include sustainability at that time. Project is routed and made into public domain are the best practices at that time.
The only thing I would like to state and add is the nature of PPP and its length of time. Is sustainability given enough thought in this context? The length of PPP in place, I would wonder if sufficient thought has been given to sustainability. Is sufficient thought been given to sustainability and is it been revisited during the course of time for which PPP is in place.

**RR:** If yes, please give an example?

**AM:** During the course of time, the PPP is been managed by the PPP co. at the operation stage, due to the length of time, it is possible that technology could be out of date in relation to energy conservation, material conservation, etc. The way school is been handled, that will make provisions in place out of date very quickly and maybe they need to make some provisions at the start or make some inclusions at the outset of project for reviewing and revising sustainability elements of the project.

**RR:** Are PPP schools project more geared towards energy on the name of sustainability?

**AM:** Yes, energy conservation, IT technologies are the key elements of sustainability and are major areas of concern on PPP projects.

**Question 4:**

*In your opinion, is PPP in educational sector successful in implementing sustainable development in Ireland? Yes/No. If Yes/No what are the reasons?*

**AM:** Yes, to a certain extent as mentioned earlier the technical environmental sustainability, economic sustainability are prime criteria under sustainability. Energy conservation, IT technology areas are key elements under sustainability which are of prime concern. Because of the long-term context, the best sustainability policy principles at that time informed the thinking around PPPs. EU influences Ireland in matters relating to PPP procurement and sustainability. There has been more emphasis on sustainabilility nationally and from the EU.

**Question 5:**
In your opinion, who would you think is responsible to ensure PPP’s in educational sector deliver sustainable development? Public/Private/End user?

AM: I think the state has the responsibility and obligation to implement sustainability. In case of PPP, it is the authority that is responsible to ensure the private sector comes forward with sustainable solution. This is at the heart of PPPs. It is not just getting the financial aspect but to also acquire best practices that may not be available to the public sector. The policy may be in place but the private sector is more geared in delivering solutions. So, the responsibility lies with Public sector in relation to policy making and the private sector in relation to transferring and implementing policy on the project. The Private sector does not set the policy; the public sector is responsible for policy.

RR: Does the End user have any influence?

AM: The End user is the part of the state, the authority. They would be responsible to the same policy and will have to ensure, what is relevant for their sector has been incorporated on their projects. Thus, they could influence it very much as the end user. They are also part of the consultation process which gives them another window to voice their requirements.

Question 6:

In your opinion does the authority (Public sector) have any power in influencing Sustainable Development design principles on the PPPs educational projects?

AM: My observation is, Yes. They have good and growing awareness that needs to be put ahead and as each project is brought forward there is growing understanding that sustainability issues get included and implemented. It will by definition, bring the best technical and economical factor of sustainability. The public sector is doing enough at that particular time. It is an evolutionary process. Our understanding and conceptualising of
sustainability is growing all the time. As awareness grows it influences policy and once policy is in place, yes, state makes a serious effort to implement sustainability.

**Question 7:**

*Is sustainable development a factor in government PPP decision-making? Yes /No, If no, why?*

**AM:** Yes, to varying degrees. Due to policy requirements it is recognised. Sustainable Development is a very large concept and it is supposed to influence everything that happens in public sphere. A greater depth and understanding of sustainability are required at public sector.

**RR:** Do you think public sector fully understands and has the knowledge of sustainability or is there a gap?

**AM:** There needs to be a more progressive policies, it is a matter of understanding among the entire player of what has to be achieved. In my opinion the way PPPs are structured it may not be easy to implement a new policy even if there is awareness. So, it is fair to say whatever is required to be implemented is implemented at that point of time. There is always room for improvement.

**Question 8:**

*Are there any barriers in preventing PPPs from delivering Sustainable Development? Yes/No. If yes please list the barriers in your opinion.*

**AM:** We do depend on consortia to give us the best solutions. We depend on what they put forward in their bits. First of all, we do depend on the syndicate who would influence the decision making of the private sector. In my opinion the private would greatly benefit by including the sustainable principles and they would benefit in the long run of the project. The private sector faces the greater benefit than the public sector because, they can get greater
benefit in the operation stage. It also becomes more cost effective in the long run for the private sector; and best practice comes from the commercial sector to that extent if they come forward for those kind of solutions, then the public sector can only benefit as the state is depending on private sector to bring those solution forward in their bid.

**RR:** Why do some PPP projects show greater inclusion of sustainable principles than others? In a bundle, why some school show greater sustainable inclusion?

**AM:** It might be very difficult for me to give the observation on that side of the project as I did not closely watch the project after contract close. I came in when the PPP platform was agreed and how individual project progressed was beyond my remit. I was involved at the evaluation stage and did make observations at a very high level of marks allocated on individual criteria, but was not part of the evaluation or assessment team. Thus, I will have no opinion to offer on the marks been allocated, on elements of individual schools. In relation to the documentation and criteria allocated in the documentation, I wouldn't have in depth knowledge to comment on. My job on the project is to see that all steps have been followed as per the PPP guidelines. I wouldn't have the depth of understanding or the technical knowledge required to comment on the same.

*Question 9:*

*What role does the authority (Public sector) have in achieving greater levels of Sustainable Development on PPP projects?*

**AM:** I think to be aware and have a balance between the technical and financial aspect of the project is crucial. What we are doing is building infrastructure for future and for that reason it should take into consideration the future requirements in forming the current policy. If it does not do so, it is of concern. It is up to the authority to have policy which will benefit them in the PPP projects. It is important that the authority brings forward policy which is important
and crucial for the development of the project. Thus, an awareness of relevant policy requirement is crucial.

**Question 10.**

*Can you give an example in SB1 PPP project that has contributed significantly to sustainable development?*

**AM:** I wouldn't have observed the different elements of SB1 so closely to comment. On the various PPP projects that I have been involved, the Courts and the third level educational projects, one thing that comes to my mind is Special Needs Education facilities provided in SB2 which was a new development which was bought forward on PPP project. The PPP projects are very much evolving as each bundle has been implemented. PPP projects learn from previous projects and apply them for example projects executed in schools, courts and third level institutions learn from each other.

**Question 11.**

*Can you give an example in SB2 PPP project that has contributed significantly to Sustainable Development?*

**AM:** It would be difficult to give an example of SB 2 projects as i am involved on a number of PPP projects in different sectors.

**RR:** The ratio split on SB1 was 60/40 and on SB2 was 70/30. In your opinion, do you think this ratio will have an impact on greater or lesser sustainability inclusion?

**AM:** Again, I wouldn't be technically competent, but in my own opinion if it is required and is included in the output spec, the bidder will come up with a best practice solution and provide at least the minimum or even come up with the best practice requirements.

**RR:** Does the ratio really matter?
AM: It surly depends on each individual site, the location of site, the climatic condition of the site. It is the outcome that is important rather than an input requirement.

RR: In SB1, we had legal, financial and technical evaluation, whereas in SB2, we had financial and technical evaluation, legal was a compliance issue? Why was this change done?

AM: Making legal a compliance issue has become a standard on all of PPP projects that I have been involved. It is a tick box exercise; it is a compliance issue. I wouldn't be in a position to say what impact that has on the ratio. The ratio and its impact, I wouldn't have a view on it.

Question 12.

In your opinion can PPP procurement be incentivised by the authority (public sector) to deliver Sustainable Design Development of educational buildings? If yes, how?

AM: In my opinion, why should private sector be incentivised to provide Sustainable Design Development, they should anyway provide best practice in the industry. Why should we spoon feed the commercial sector to that extent? If it is good/best practice and cost efficient it should surly be included in the bid. The public sector should be getting what is the best practice in the industry, which is cost effective and sustainable at the same time. Personally, I would not be in favour of giving incentives to private sectors to come forward with solutions which they should anyway do it.

The public sector should have the knowledge and training up to date in relation to sustainability. There is no point, if personnel on public sector are not up to speed in relation to policy and technical development in this area. To me people on the public sector have great knowledge in the field of school building. In my own opinion you don't need to make huge changes as long as policy and legislation is in place. It is up to the implementing authorities to get it right and to make the best use of what is out there. The commercial sector's
expertise is the main reason why they have been bought on board. It is the private sector expertise in relation to technical, commercial and financial is the reason why they are on board and they should demonstrate that on the projects.

Question 13.

In your opinion are the authority (Public sector), the private sector and the end user familiar with the principles of sustainable development?

AM: In the educational sector, the public sector is very hands on the infrastructure development thus would have greater and in-depth knowledge of the requirement. In case of traditional project, the public sector could be limited due to financial constrain whereas when a project is been sanctioned under the PPP route, there is greater flexibility and can achieve greater innovation by the involvement of private sector. The end user is at the bottom of the line, they are most concerned with what goes into the building. i.e. the accommodation requirement which is been finalise in conjunction with the public sector and how good is the operation of the building is the main concern of the end user. They also have other issues in relation to resource that they need to think about.

Question 14.

In the PPP education sector, what are the biggest challenges with regards to Sustainable Design Development in Ireland?

AM: The availability of resources is the biggest challenge, that is why PPP are been bought in. The resources necessary to achieve the best solutions is the biggest challenge. Following on from that, every sector has to work with the limited resources available. Thus, if there is a strong policy in relation to sustainability implementation it becomes easier. If a strong policy is not in place, then insufficient design practices will be followed and proposed by the
private sector. They would propose solutions which are as cost effective as possible with limited resources available.

**RR:** Does sustainability cost more?

**AM:** Not necessarily, it may at initial stages, but at the outset it will not. An expensive capital will benefit in the long run. It will save you in the operation cost. So, it allows pay back in the long run. On PPP it is the life cycle cost and not the upfront cost that matters.

**RR:** So, would you agree that sustainability cost more is a myth?

**AM:** I would say so; you have to look sustainability in relation to life cycle cost it's not enough to see just the initial capital cost. That's just my initial observation. That does not mean that there are solutions out there which are sustainable and does not cost more

*Question 15:*

*In your opinion what improvements should be made to the PPP process to successfully implement Sustainable Design Development on the PPP educational buildings in Ireland?*

**AM:** I think firstly, adherence to sustainable principle and regulations that are in place. Secondly, to draw in the best practice principle that are there, that may not even be public policy yet, but that would be seen to be useful, if that can be done. Thirdly, both the personnel involved in the process are most up to date with good practice thinking.

My experience on the topic of sustainability is when i was working with the council. In council sustainability is policy and cost saving driven. Heavy emphasis is on Sustainable Development, sustainable energy usage etc.

**RR:** Please advise us and share any other valuable information that can be incorporated in this research. Would you like to add and benefit this research from your wide experience in the field of sustainability?
**AM:** One thing that I was impressed was the level of expertise in the public sector on schools’ projects. People who have the ground expertise in the field of school design should be included from very start of the project. This will benefit the project by including and setting a level in relation to the basic information available on the project. It will also help in bringing the up to date thinking available on the project. After all, the private sector on the project is dependent on initial information provided or made available to them on the projects. The basic information is very crucial in relation to the progress of the project. If the right expertise and experience and up to date thinking is available in house that will show and appear in the documents which are made available to the private sector.

**RR:** From a policy perspective would you like to add anything to the process?

**AM:** As I said, I see PPP process and concept been developed all the time. There is improvement all the time in terms of process, improvement of the process is seen all the time. PPP projects benefits from the previous PPPs all the time. The knowledge that is been brought all the time on the PPPs comes across on documents produced and the in-house expertise comes forward in the details of the documents produced.

There may be a need to evaluate PPP projects in relation to sustainability and as per my understanding this is exactly what your research is aiming to do. It is evaluating the success of first PPP in more detail in relation to sustainability requirements. I know that PPP’s have been evaluated consistently, but they need to be evaluated from different perspective as you are doing it from sustainability perspective. In case of educational sector, you need to look at how special needs of pupil have been managed in the PPP projects. How it is different from the conventional set up.

**RR:** Is there a major difference between conventional special needs requirement and PPP special needs requirement?
**AM:** I am not very sure but I would think that on traditional projects special needs requirements are included at a later stage, whereas on PPPs the work is done at the outset. In conventional procurement retrofitting can be done whereas in PPPs everything has to be decided and finalised at the start. It has very little or no flexibility to incorporate changes during implementation stage.

**RR:** Is there a national sustainability policy in place in Ireland?

**AM:** I would think so. Retrofitting may be a feature of sustainability especially the buildings that are retrofitted can be more expensive to implement.

**RR:** With your background of working with the Department of Environment, would you say building regulations are doing enough in relation to incorporating sustainability?

**AM:** Sometime earlier, sustainability was seen merely as environment sustainability. As we both spoke earlier, sustainability should be environmental, social and economic sustainability. It should have social aspect, economic aspects along with environmental aspect from the technical side. By nature, it is an evolutionary process. In my own opinion, that is the way it should happen. You could be putting demands on sectors and businesses & commerce that might not be possible to maintain. So, sustainability has to be all encompass and move forward in an evolutionary way.

**RR:** Is there any document that you have come across of interest that you could recommend me to read in relation to my topic of research?

**AM:** Document published by Department of Environment on ‘Spatial planning’ and ‘Sustainable Communities’ is worth reading which focuses on sustainability. For example, cycling to school is a sustainable transport solution. It depends on the policy that is in place, generally. There is some criticism of building regulation going too far in terms of guidance which becomes requirements. There is criticism that it imposes greater cost in
implementation on Businesses. But in my own opinion, policy has to be continuously developed.

**RR:** On the topic of social sustainability, is there anything that you would like to add?

**AM:** Greater awareness by the authority in relation to social sustainability should be undertaken. To be fully informed by the physical planning requirement this is based on sustainable principles. The First principle is to inform the local physical and economic planning of an area. Schools have to fit into that big picture so it would be worth considering being informed.

**RR:** PPPs emphasis on social partnership. Do you think this really happens?

**AM:** From what I have seen, partnership is strongest at the initial consultation stage. Especially, in the schools projects the principals are so heavily involved in finalising the requirement, developing the document to be given to the private sector. A new building requires planning commission which emphasis social inclusion. Thus, there should be strong partnership with the local authority.
APPENDIX: 9

Background

At this stage of my PhD, the conceptual model developed is presented to professionals from the PPP industry for their comments. The participants were chosen based on their availability and their interest to participate. The comments received were analysed in the context of the proposed model.

The research progressed from literature review that identified challenges facing the public and private sectors which was related in the context of Irish PPP process. This helped in identifying the current environment in which the PPPs are implemented and the guiding legislation that help in the inclusion of sustainability on current PPP educational projects. Based on the outcomes following step-by-step guide is developed and proposed in the context of PPP process. This step-by-step guide is attached for your ready reference and is presented to the participant to comment on its effectiveness in incorporating sustainability in the context of implementing future PPP projects in Ireland.

Testing Questionnaire:

Based on the 8 step-by-step guides to achieving sustainability in relation to the capital appraisal guidelines, please answer the following questions:

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<td>1. Overall, what is your opinion regarding the 8 step-by-step guide? Is something missing, are all of the important aspects included in this process?</td>
<td>Yes/No</td>
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<td>2. In your opinion, are the defined steps descriptions useful and achievable? If no, why?</td>
<td>Yes/No</td>
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<td>3. Do you think this will help in achieving sustainability on future PPP school building projects? If no, why? What should be different?</td>
<td>Yes/No</td>
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<td>4. Do you think the development suggestions are useful for ensuring sustainability on PPP school building projects? If yes, in your opinion, are the changes possible to implement? If no, why do you think that is?</td>
<td>Yes/No</td>
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**Proposed Step-by Step guide to achieving Sustainability in Irish PPP School building Projects (Process Model Approach).**

### Strategic level

Establish DoES overall strategy on sustainability:
- Inbuilt the overall strategy into individual departments within DoES
- Individual policy document to be in place in relation to each department within the big umbrella of DoES.

### Project level

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<th>Critical Success Factor</th>
<th>Description</th>
<th>Actions relating to PPP Procurement Steps within the Capital Appraisal Guidelines</th>
<th>PPP Procurement Steps within the Capital Appraisal Guidelines</th>
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<td>1</td>
<td>Integrate Sustainability into the PPP Environment</td>
<td>Develop overall Sustainability Policy for PPP educational building projects in line with DoES overall Sustainability Strategy</td>
<td>This means streamlining the sustainability development standards to bring together stakeholders, design, construction &amp; operation EU standards, project strategy and research and development at the project appraisal stage.</td>
<td>Appraisal Stage</td>
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<td>Appropriate resources allocated for the project.</td>
<td>Awareness and know-how of sustainability</td>
<td>Identifying needs of the project in hand and allocate appropriate resources that would facilitate sustainability inclusion and implementation at the project appraisal stage step 3. (Approval to proceed (if significant staff resources involved, I detail appraisal stage).</td>
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<td>Draw a Practical Framework for deriving the criteria to be included in OS. Thus, developing OS that addresses and ensures the inclusion of sustainability goals &amp; objectives set for the project.</td>
<td>Critically outline and align the various PPP projects stages with the sustainability requirements of the project. Lay out detailed elements of Input and Outputs for various stages of the project.</td>
<td>Integrate sustainability into the priorities of the project, clarify grey-areas. Clearly identify Social, Environmental and Economic Sustainability parameters to each stages of the project. Planning stage Step 8 (Compile Output Specifications and Public Sector Benchmark (PSB))</td>
<td>Planning Stage</td>
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<td>Develop the contract documents to include sustainability parameters to be reflected in the award criteria.</td>
<td>Identify the specific Social, Environmental, Economic sustainability parameters and allocate them appropriately to public and private partnership.</td>
<td>Setting award criteria which clearly identifies the weightage for incorporating bids with sustainable development criteria to ensure the inclusion and implementation of sustainability on the project in hand.</td>
<td>Implementation Stage</td>
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<td>6</td>
<td>Develop Strong/Stringent Evaluation procedures in relation to sustainability inclusion.</td>
<td>Evaluate project with specific social, environmental &amp; economic criteria to ensure that inputs meet the output requirements.</td>
<td>The Social, Environmental and Economic sustainability criteria as derived to be used as basis for the evaluation of outputs and linking performance to payments</td>
<td>Implementation Stage</td>
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<td>Review to be carried out after the project is constructed.</td>
<td>To find any shortfall in the process/policy in relation to sustainability requirement</td>
<td>Lesson learned to be used for further PPP projects to be implemented</td>
<td>Completion of Implementation stage.</td>
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<td>Develop Strong/Stringent Monitoring procedures for the project with Feedback Control</td>
<td>Monitor project process and ensure that inputs and outputs are met.</td>
<td>The Social, Environmental and Economic sustainability criteria as derived to be used as basis for monitoring and linking performance to payments</td>
<td>Operation Stage</td>
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<td>Mid-term review to be carried out after the project is operational.</td>
<td>To find any shortfall in the process/policy in relation to sustainability requirement.</td>
<td>Lesson learned to be used for further PPP projects to be implemented</td>
<td>Half way to the Operation stage</td>
</tr>
<tr>
<td>8</td>
<td>Final review of the project to capture lessons learned. Review the entire process to document the shortfalls in relation to sustainability implementation. Review the PPP policy if need be for delivering PPP by integrating lessons learned to reflect along with other areas the shortfalls captured in relation to aspects of sustainability. Integrate and update the current policy to reflect learning outcomes. (Repeat Step 1 where Necessary to Broaden Scope)</td>
<td>Identify the areas where there are major divergences and redefine the processes.</td>
<td>Critically assess project for sustainability parameters. Develop feedback loop to change the system where necessary.</td>
<td>Hand back Stage (completion of concession period)</td>
</tr>
</tbody>
</table>
LIST OF PUBLICATIONS

• Presented paper on “Sustainability in the provision of PPP educational building projects in Ireland”
  29th April 2009
  E-BuHu-MC 2009
  European Built and Human Environment Master Class

• Presented paper on “Comparison of Indian PPP Construction Industry and European PPP Construction Industry: Process, Thresholds and Implementation”
  10th – 13th May 2010
  CIB World Congress 2010, Manchester, UK

• Presented paper on “Sustainability in the context of PPP educational projects in Ireland”
  March 30th – 2nd April 2011
  Architectural Engineering Conference, Oakland, California, US
LIST OF EMPLOYABILITY SKILLS
AND
DISCIPLINE SPECIFIC SKILLS TRAINING

• By undertaking this research has given me the level of proficiency in the PPP building procurement process and has educated me in the implementation of PPP educational projects in Ireland.

• Involvement with the PPP educational programme has given me the insight into how the PPPs are implemented thus highlighting and understanding the shortfalls currently within the PPP process in relation to sustainability inclusion.

• Undertaken CPD training in the following:
  ➢ BREEAM assessment for offices
  ➢ BREEAM assessment for schools
  ➢ BIM modelling
  ➢ LEED assessment for buildings.

• By undertaking this research has greatly benefited my work. It has helped me to identify the shortfalls in implementing sustainability and introducing various additional specific sustainability criteria to be incorporated in implementing PPP school projects.

• The knowledge & skills that I have gained by undertaking this research has given me an expertise which will help and add to my capabilities thus increasing my employability prospects.