TIME TO START WARMING TO DISTRICT HEATING:

LOCAL AUTHORITY CHAMPIONS OF CHANGE

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Abstract

District heating has historically lacked a consistent institutional base in the UK. However, a number of Local Authorities are acknowledging the potential of district heating as a vital enabling infrastructure for low carbon heat. Although the role of dedicated ‘champions’ has been widely acknowledged in studies of innovation, very little is known about the public sector champion of change. This thesis contributes to knowledge in this area by paying specific attention to the Local Authority champion of district heating.

It is proposed that existing approaches to the study of champions tend to be action focused. The failure to appreciate the role of contingency and the interaction between structure and agency results in unbalanced championing accounts that either over, or under-play, crucial aspects of the championing endeavour. The aim of this thesis, therefore, is to address the interplay between action and structure through examining the ‘origins’ of champions of district heating.

For this purpose a mixed methods approach is employed drawing on insights from sociotechnical theory as well as notions of human and social capital. The opportunity for championing is found to be strongly context dependent and driven in part by public sector obligations. However, in the absence of a specific district heating policy the scope for the technology as an ‘alternative’ solution lies in the creative interpretation of policy by innovative individuals. The results show that championing is the function of the interaction between the intentions and attributes of individuals (champions) and more complex contextual factors. A novel conceptual model is developed that reveals the critical features of the district heating champion, the public sector organisation and district heating as a large technical system (LTS). In light of renewed Government interest in district heating, recommendations are given on the ability of the Local Authority to ‘harness’ a champion of change.
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<tr>
<td>ACC</td>
<td>Aberdeen City Council</td>
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<td>AOCB</td>
<td>Affiliation-oriented organisational citizenship behaviour</td>
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<td>BRE</td>
<td>Building Research Establishment</td>
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<td>CERT</td>
<td>Carbon Emissions Reduction Target</td>
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<td>CESP</td>
<td>Community Energy Savings Programme</td>
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<td>CHP</td>
<td>Combined Heat and Power</td>
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<td>CHPA</td>
<td>Combined Heat and Power Association</td>
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<td>CEP</td>
<td>Community Energy Programme</td>
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<tr>
<td>COCB</td>
<td>Challenge-oriented organisational citizenship behaviour</td>
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<td>DE</td>
<td>District Energy</td>
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<tr>
<td>DECC</td>
<td>Department of Energy and Climate Change</td>
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<td>DED</td>
<td>Distributed Energy Delivery Team</td>
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<td>DEFRA</td>
<td>Department of the Environment, Food and Rural Affairs</td>
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<td>DH</td>
<td>District Heating</td>
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<td>DHN</td>
<td>DH network</td>
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<td>DOE</td>
<td>Department of Energy</td>
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<td>EfW</td>
<td>Energy from Waste</td>
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<td>EPC</td>
<td>Energy Performance Contracting</td>
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<td>ESCo</td>
<td>Energy Services Company</td>
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<td>EST</td>
<td>Energy Savings Trust</td>
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<td>EU</td>
<td>European Union</td>
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<td>FF</td>
<td>Fossil Fuel</td>
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<td>FP</td>
<td>Fuel Poverty</td>
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<td>HA</td>
<td>Housing Association</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>HCA</td>
<td>Homes and Communities Agency</td>
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<td>HNDU</td>
<td>Heat Networks Development Unit</td>
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<td>IRR</td>
<td>Internal Rate of Return</td>
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<td>JCA</td>
<td>Joint Cooperation Agreement</td>
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<td>LA</td>
<td>Local Authority</td>
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<td>LDA</td>
<td>London Development Agency</td>
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<td>LEP</td>
<td>London Energy Partnership</td>
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<td>LTS</td>
<td>Large Technical System</td>
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<tr>
<td>OCB</td>
<td>Organisational Citizenship Behaviours</td>
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<td>OECD</td>
<td>The Organisation for Economic Co-operation and</td>
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<td></td>
<td>Development</td>
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<tr>
<td>SCC</td>
<td>Southampton City Council</td>
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<tr>
<td>SIC</td>
<td>Shetland Island Council</td>
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<tr>
<td>SST</td>
<td>Social Shaping of Technology</td>
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<td>STS</td>
<td>Science and Technology Studies</td>
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<tr>
<td>TWh</td>
<td>Terawatt-hour</td>
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<td>RHI</td>
<td>Renewable Heat Incentive</td>
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CHAPTER 1: INTRODUCTION

District heating has historically lacked a strong and coherent institutional base in the UK, early attempts were piecemeal and poorly implemented (Russell, 1993). At present, a ‘step-change’ is occurring in the UK where the Government has acknowledged District Heating (DH) as a vital enabling infrastructure for low carbon heat. The move towards ‘district thinking’ is fuelled by a growing number of Local Authorities (LA) seeking to investigate DH as an energy option for their constituency. Councils are set to play a pivotal role in the initiation, development and, in some cases, the operation of DH networks. A greater uptake of DH presents significant challenges due in part to the ‘lock-in’ of the existing energy systems. Technology is both socially shaped and socially shaping and the implementation of any technological system is a complex sociotechnical matter. The ability to introduce an innovative technology such as DH may in many cases be dependent on the presence of a dedicated individual; in the seminal words of Schön, (1963, p.84), “the new idea either finds a champion or dies.” Indeed, whilst the role of the champion in innovation success is widely appreciated (Howell and Higgins, 1990), very little is known about the public sector district heating champion. Furthermore, studies which consider how and why a champion emerges (the ‘origins’) are relatively limited (Renken and Heeks, 2014). A number of authors have highlighted the role of dedicated individuals who work within a Council to ‘champion’ the DH agenda (Hawkey, 2009; Bolton, 2010). However, there is limited empirical evidence of the ‘district heating Champion,’ given their potentially vital role in supporting the development of a DH system, it is the objective of this thesis to examine the origins of public sector champions of district heating.

As appreciated by Markusson (2010), studies of championing tend to sit
on an action-structure continuum, and many of the debates in the literature stem from the failure to acknowledge the interaction between action and structure. At the structural end, researchers focus on the organisational features that enable/limit championing behaviour, whilst action-led approaches pay particular attention to the qualities and behaviours of champions. Those studies which adopt an action-based perspective generally focus on a relatively narrow range of attributes (Renken and Heeks, 2014) that tend to be based on the subjective opinion of the researcher rather than the result of a validated personality assessment (Howell and Higgins, 1990). In addition, the motivation of the champions, their career history and educational pathways that have led them to their current position tend to be downplayed. At the structural-end, there is limited research on the organisational context and champion emergence, particularly in relation to public sector organisations. Central to this is the extent to which the ‘opportunity for championing’ (Markusson, 2010, p.783) emerges as a result of more structurally-determined factors or is shaped by the will and initiative of individuals.

In both action-led and structural-based accounts of championing, there is an inclination to ‘black box’ the innovation, the nature of which is either ignored or not fully appreciated. Damanpour and Schneider (2009) support this assertion, highlighting the importance of acknowledging the characteristics of the technology citing cost, complexity and impact as key macro-level issues which influence the championing attempt. The black-boxing of the innovation acts to detach the champion from his/her purpose, and neglects the reciprocal nature of technological development. District heating as a large technical system (LTS) may impose specific demands on system building champions which are worthy
of investigation.

Each extreme perspective falls short of a full explanation of championing. It is the contention of this thesis that a comprehensive and balanced understanding of championing must take into consideration both the organisational context, the actions and characteristics of the champion and the nature of the innovation. The central aim of this study, is therefore, to uncover the interaction of action and structure in episodes of district heating championing. This will involve an investigation of the extent to which the propensity to champion district heating is a function of the intrinsic qualities of the champion or is more context-dependent; as a reaction to organisational circumstances. The implications of which will be explored in relation to the growing institutional agenda for district heating with consideration given to the possibility of ‘harnessing’ champion behaviour. In order to achieve this aim, 17 Local Authority champions of district heating in the UK are examined, drawing on insights from theories of social and human capital as well as sociotechnical perspectives. It is anticipated that an examination of the district heating champion will be of relevance to the emerging district heating agenda in the UK, and in contrast to recent studies that have adopted a broader more macro-level approach (Hawkey, 2009; Bolton, 2009), contribute to the limited narrative on DH system building.

In doing so, this thesis makes two contributions to the study of champions of innovation; as an empirical contribution the study centres on the public sector development of district heating systems in the UK, which as argued, have received limited research attention. A conceptual model is developed which reveals the critical features of DH championing; exposing the interaction between the champion, the organisation and the
nature of DH as a large technical system (LTS).

1.1 Research Questions

The central proposition of this thesis is that organizational champions play a pivotal role in the implementation and adoption of innovations such as DH, and that a greater understanding of how and why these individual champion (the ‘origins’) may become increasingly important in light of the institutional drive to increase the update of DH systems. Therefore, the primary research question is:

**How and Why do certain individuals emerge to champion district heating within a Local Authority Context?**

A Mixed Methods approach has been adopted in order to address the central research questions, the justification for this choice is detailed in Chapter 6. Drawing on notions of human and (organizational) social capital the origins of DH champions will be revealed. The following sub-research questions stem from the central research questions:

**How does the ‘opportunity for championing’ arise?**

In order to understand more about the emergence of champions in a public sector context, the study explores how the ‘opportunity for championing’ develops. Central to developing this understanding is uncovering the interaction between championing behavior, i.e. initiative and more structural factors such as organizational agenda. The organizational motivation for district heating is examined, considering the influence of public sector duty and policy interpretation. Thought is given to the extent to which formal appointment, in comparison to informal emergence, affects the ability of the champion to exploit (organizational) social capital resources.
How does the nature of DH as a large technical system (LTS) affect the championing attempt?

The study draws on sociotechnical literature and its fundamental rejection of technological determinism; a contention of this thesis is that as a large technical system (LTS), DH is both socially shaped and socially shaping. This is an important theoretical assertion as it resonates with the central theme of the study on the tension between structure and agency in accounts of the championing of change. Drawing on Hughes’ notion of a System Builder, it is proposed that the champion as a central ‘system builder’ moulds the DH system in order to fit the organizational objectives, at the same time his/her actions are constrained by the technological characteristics of district heating. The challenges associated with championing a large-scale infrastructure, including the complexities surrounding multi-stakeholder business models and the implementation of an infrastructure which is a relatively ‘unknown’ quantity in the UK mean that the champion of DH requires specific attributes and actions in order to succeed in his/her attempt to initiate and secure change. It will be shown how the characteristics of the technology place specific demands on the system builder.

The study explores the way in which a champion may influence the technological 'style' of a DH system. Drawing on Joerges (1988, p.12) who refers to technological style as, “the widely varying shape ‘one and the same’ technology takes under different geographical, political legal and historical conditions.” As Bolton (2010) drawing on Hughes proposes, style is the result of the interaction between each system and its environment, which is heavily dependent on context. As such it is proposed that although the core features of a DH system remain constant, the divergent championing context
may produce varying DH styles. The ways in which the Local Authority champions exploit (organizational social capital, as well as their own human capital resources in their efforts to implement organizational change will be revealed. It will be shown that the notion of ‘system building’ is highly relevant to the study of district heating champions, demonstrating more widely the significance of the system building notion in modern contexts.

1.2 Outline of the Thesis

The thesis outline is as follows:

Chapter 2 provides a background to DH in the UK, examining some of the early historical experiences of DH to the growing Local Authority interest in DH. The business models associated with DH and the formation of the Energy Service Company (ESCo) are also explored looking at how DH is perceived by potential subscribers; including pricing aspects and cultural challenges to connection, institutional support and the changing role of the state in energy matters. The growth in local government interest will also be discussed as a reflection of a move towards ‘district thinking’ that appears to be taking place at Council level across the UK. Technological development will be shown to have many complex facets that impact upon DH system building.

Chapter 3 interrogates the literatures that examine the notion of a central actor, the ‘champion.’ It will be shown that studies examining the champion phenomena tend to sit on an ‘action-structure’ continuum which reflect an on-going debate on the primacy of the individual over
his/her context. Those studies which emphasis the qualities/behaviours of the individual tend to emphasise the importance of the individual over his/her context (action-led approaches), whilst conversely those studies which adopt a more structural perspective argue that context, and the opportunity for championing is more important than supposed innate qualities of the individual (Markusson, 2010). These tensions generate a number of key themes in the literature which are explored. It is argued that while existing literatures provide valuable insights into the ‘origins’ of champions, they lack a sufficient examination of both individual and organisational intent and the role of motivation in shaping the ‘opportunity for championing,’ particularly in a public sector context. In addition, the general tendency to adopt a position at either end of the action-structure continuum results in unbalanced accounts of championing which fail to fully appreciate how the characteristics and actions of the individual interact with structural aspects of the organisational context.

In order to fill this gap, Chapter 4 introduces the concept of capital, in terms of human and organisational (social) capital as a useful way of conceptualising both the propensity to champion on an individual level, and the inherent resources (human capital) and organisational resources (organisational social capital) which contribute towards success in such endeavours. Organisational Citizenship Behaviours (OCBs) are highlighted as being relevant to the study of champions of change due to their association with the creation of organisational social capital on an individual level.

Chapter 5 enables an appreciation of district heating as a sociotechnical system. The large technical systems (LTS) perspective sheds light on the
role of the central actor in technological development, the ‘System Builder.’ The emphasis on agency and contingency in sociotechnical assessments is highly relevant to the study of district heating champions, promoting an approach which balances context with action. A number of parallels are drawn between the notion of the system builder and the ‘champion,’ highlighting its continued relevancy to the study of technological development in modern contexts.

Chapter 6 introduces the methodological approach chosen, the research strategy and the research instruments. The justification for adopting a mixed methods approach will be detailed, compared more widely with the methodological approaches in the field. The issue of bias and the quality of the research will also be addressed.

Chapters 7 and 8 form the main empirical chapters of the thesis. Chapter 7 explores the organisational context and uncovers how the ‘opportunity for championing’ arises in a public sector context. Central to this is an examination of the organisational agenda for district heating and the role of individual initiative in shaping the championing opportunity. The critical organisational (social) capital resources created and exploited by the champions are revealed, highlighting the importance of human capital resources and organisational citizenship behaviours (OCB). System building strategies are shown to rely on the exploitation of both (organisational) social capital as well as human capital resources.

Chapter 8 reveals the human capital features of the champions encompassing educational attainment, career experience, personal motivations, personality attributes and value systems. It will be shown that the propensity to champion, as well as the effectiveness of the
champion in his/her championing endeavours is influenced by the ability of the champion to exploit his/her human capital resources.

Chapter 9 is the concluding chapter and the main findings are summarised in the context of the research aims and objectives, reflecting on the central contributions of the thesis. The implications of the research for the growing DH agenda in the UK are examined, considering the extent to which the Local Authority Champion of district heating can be ‘harnessed.’ The limitations of the research are discussed, and possible applications and extensions of the work are given.
CHAPTER 2: DISTRICT HEATING IN THE UK

2.1. Introduction

The purpose of this chapter is to provide a background context for the championing of district heating in the UK. The chapter interrogates some of the key sociotechnical features of DH which impact on DH system building, including political agendas and Government support, cultural issues and perceptions of DH, as well as market conditions and economics. This will enable an appreciation of the broader context of the DH Champion.

2.1.1 ‘District Thinking’

District heating has historically lacked a strong and coherent institutional base in the UK; early attempts were piecemeal and poorly implemented. Russell (1993) has shown how existing organisations who, due to their own vested interests in prevailing systems (namely the electricity sector), were wholly unsupportive of this new technology. More recently a number of Government reports have been produced examining the potential and benefits of DH systems (Pöyry, 2009; BRE et al. 2013). Both studies emphasise the importance of strong public sector involvement, however, a coordinated approach to the generation of heat and power has not been adopted in the UK. As Russell (1993, p.33) states, electricity generation and heat supply are “almost entirely separate activities, physically and institutionally.” Indeed, historically CHP/DH had to penetrate a strongly entrenched paradigm in which large centralised condensing stations remote from potential heat loads were
the norm (Russell, 1993). Up until 2011 and the introduction of the Renewable Heat Incentive (RHI), there has been little formal regard for heat. Historically renewable heat policies centred on the provision of capital grants, mainly for biomass or small scale solar projects (Bolton, 2010).

At present a ‘step-change’ may be considered to be occurring whereby both central Government and local Government are increasingly considering DH systems as a viable option to meet their sustainability goals. The move towards ‘district thinking’ is characterised by a growing number of LA’s seeking to investigate DH as an energy option for their constituency (Hawkey, 2011). A number of Councils in Wales have instigated DH feasibility investigations, although gaining higher level Welsh Government support for DH has not been an easy task (Participant 13). In addition, national Government looks set to support and encourage this trend through the provision of two key policies.

The Future of Heating: Meeting the Challenge sets out ambitious plans to increase the role of DH in future UK energy systems. Secondly the world’s first renewable heat strategy, the Renewable Heat Incentive (RHI), aims to increase the proportion of heat generated from renewable sources; its potential impact on future DH uptake will be discussed. These two policies demonstrate a growing political support for DH systems in the UK and begin to provide the technology with the institutional base it has thus far lacked. The historic role of the public sector in energy matters will briefly be examined and provide an appropriate point of departure for highlighting the growing potential role for the LA in energy matters, as rising fuel bills and a mounting discontent with the private sector point to the need for greater governance in energy
concerns.

2.1.2 The Future of Heating: Meeting the Challenge

District heating (DH) has now firmly been placed on the UK energy agenda with the proposal in March 2013 of two significant policies (The Future of Heating: Meeting the Challenge), which are set to run until 2016 (DECC, 2015). The study was informed by research into the barriers of UK DH undertaken by BRE et al. (2013) and was implemented by the UK Conservative and Liberal Democrat Coalition (2010-2015).

Firstly, a specialist unit (the Heat Networks Delivery Unit [HNDU]) was developed within the Department for Energy and Climate Change (DECC) in order to provide expert advice and guidance for Local Authorities (LA’s) seeking to implement DH schemes. A funding stream of an estimated £6m was available over a two year period which Local Authorities could access to aid the costs of commissioning feasibility and technical reports. The funding stream is available up until the procurement stage shown in Figure 2.1. Support will be given through the development stages of a project up to procurement and delivery (illustrated in Figure 2.1). The fund will meet 67% of the estimated costs of developing technical and financial feasibility assessments (or the improvement/expansion of existing networks). This is an important aspect; as well as encouraging the initiation of new systems, the policy also supports the expansion of existing networks. The responsibility for the remaining 33% of study costs will rest with the LA (Great Britain, Department for Energy and Climate Change, 2013).
Figure 2.1: Heat network development stages
(Adapted from Great Britain, Department for Energy and Climate Change, 2013)
In order to be eligible for funding, a Council must present ambitious and innovative proposals for the development and delivery of heat networks that as far as possible make use of renewable/waste sources of energy. The criteria for selection will be based on:

- the potential for commercial development

- contribution towards low-carbon and energy-reduction objectives

- compatibility with wider low-carbon and growth agendas (where applicable)

- a serious commitment to robust project management and governance.

Great Britain. Department for Energy and Climate Change (2013)

The selection criteria aim to ensure that a potential project is commercially robust, built on sustainable foundations. There is a strong emphasis on carbon reduction through the utilisation of renewable/waste resources, as a complement or alternative to gas CHP and low temperature networks. The application process itself appears fairly lengthy; applicants are put through six bidding rounds before the idea can be approved for official feasibility. Should applications fall short of the funding threshold but present commercial potential, advice will be given as to how to improve applications for further consideration. The strict criteria will arguably necessitate significant time, effort and commitment on the part of the LA to ensuring that the project is eligible for funding.
In addition, it should be noted that Scotland are advancing their own DH agenda; the Scottish Government DH Action Plan (2013) is a response to an Expert Commission on DH which provided recommendations for the future of DH in Scotland (The Scottish Government, 2013). The Action Plan includes a roadmap detailing the Scottish Government’s plans to work with the public and private sector in support of DH development. The Government have also made available a District Heating Loan Fund which public and private sector bodies can access to assist with the costs of developing DH networks. The Scottish Government has established targets for the installation of 1.5 TWh of district heating to deliver heat to 40 000 households by 2020 (EST, 2014) and has implemented a range of policies and incentives to increase the deployment of DH networks in Scotland (The Scottish Government, 2013).
Historically, Government support for DH has been fractured; a drive to implement DH systems in Social Housing in the 1960’s-1970 was hindered by inadequate design and installation (Participant 1). The Community Energy Programme (CEP) of the 1980s provided financial assistance to DH schemes, but has been criticised for the administrative burden that had to be endured (Participant 5). Indeed, West et al. (2010) note that lengthy application processes can be a deterrent to would be investors in the uptake of renewable technology. It was generally acknowledged that the UK Government gave little thought to heat in terms of Energy Policy (Participant 6). This position changed with the introduction of the Renewable Heat Incentive (RHI) in 2011 and the Strategic Framework in 2012-2013. Growing pressure to meet heating needs through low-carbon means has led the UK Government to turn its attention once more to the potential of DH schemes:

Over the coming decades, the use of networks of pipes to deliver low carbon heat in the form of hot water (or even steam) from a central source may be an effective means of providing low carbon heat to buildings without the need for major disruption to buildings themselves (Great Britain. Department for Energy and Climate Change, p.60. 2013).

The significance of the policy for the future energy makeup of the UK cannot be underplayed as the Combined Heat and Power Association, CHPA (2012, p.1) attests; the nature of the strategy is a marked departure from the past and could ‘herald a new era for district heating.’ Indeed, the policy represents a radical departure from established Government practice with the potential to significantly alter the infrastructural landscape of the UK. However, Kemp in Veneables (2013) states that little regard has been given to the impact on users, stating that currently
the low cost of gas and the relatively low costs of boiler replacement over their lifetime suggests that people maybe unprepared for the more costly option that DH could present. Yates (2009) echoes these concerns arguing that the task of influencing consumer opinion should not be underestimated. However, as part of policy and informed by BRE et al. (2013), further measures have been identified as pivotal to supporting the long-term development of networks, including consumer acceptance and protection, contract mechanisms and aspects of heat metering. Following this recommendation, Great Britain, Department for Energy and Climate Change (2013) are now seeking to endorse an industry-led consumer protection scheme for DH users and encourage the DH industry to engage with consumer groups in raising the consumer protection agenda. The importance of considering the ‘user’ is emphasised in Upham and Jones (2010), who note that of key concern to potential DH customers is fear over being ‘locked in’ to long-term energy contracts, the disruption associated with the installation of the new technology, the reliability and the cost. As such, significant consideration should be given to the subscriber group and how best system-builders can positively influence the propensity to connect to a DH network.

2.1.3 The Renewable Heat Incentive (RHI)

In 2011, the UK Government launched the World’s first financial incentive for the generation of renewable heat, the ‘RHI.’ The Energy Act (2008) underpins the scheme which is administered by the Gas and Electricity Regulatory body, Ofgem. Indeed, as acknowledged by Connor et al. (2015), the RHI, as well as the Feed in Tariff (FIT) and the ‘Contract for Difference’ mechanism, represent a significant change
from the historical preference for quota based mechanisms. The RHI is split into two phases. In the first phase, long-term tariff support is provided for the non-domestic sectors, the big heat users - the industrial, business and public sector – which contribute 38% of the UK’s carbon emissions.

District heating is recognised under the scheme and is eligible for support, providing an appropriate fuel is used such as biomass. During the consultation phase an uplift to the tariff to help alleviate the costs associated with DH infrastructure (namely pipework) was previously considered. However, Great Britain. Department for Energy and Climate Change (2011, p.56) stated that further work is needed to ensure that this would represent ‘good value for money.’ Although the way in which the RHI tariff is structured has caused criticism, the Champion of one of the UK’s most well-established DH systems explains:

*It has often been said that the RHI encourages small schemes with oversized boilers. It could have a detrimental effect on the expansion opportunities of one of the few “large” schemes in the UK and could even reduce our customer load.*

*(Champion 1)*

More generally, Connor et al. (2015) suggest that the launch of the scheme was not without its problems, citing confusion over metering requirements and the application process itself as the reason for a large number of applications being refused. It is argued that the continual delays in the introduction of the policy, as well as constant tariff reductions and reviews, created uncertainty in the renewable heat sector
for both investors and consumers. Jagger et al. (2013) highlight this issue, stressing that there can be a mismatch between the need for long-term stability in the market for investors and political constraints which engender a slower more incremental approach to policy.

Connor et al. (2015), in their assessment of the effectiveness of the RHI policy to date, suggests that biomass combustion in heating systems has increased accounting for 85% of the renewable heat generated in the UK in 2012. It is suggested that significant growth of novel technologies (heat pumps for example) will likely occur closer to 2020. It is further stated that there has been 7418 applications in the domestic sector since the policy was implemented, with 4961 installations, although it is argued that 86% of these refer to installations that were already in place before the policy began.

Renewable heat generated in the UK has had a modest growth since the introduction of the scheme from 16.4 TWh in 2012 to 20.1 TWh in 2013, representing a growth rate of 22.6%. This compares with an average annual growth rate of nearly 17% from 2006 to 2012 (Connor et al. 2015, p.741). Should the UK meet its renewable heat target of 12% (of total heat generation) by 2020, an average annual growth of 18% will need to be achieved. Bergman (2013) suggests that in the domestic sector predications may not be as impressive as hoped due to solar thermal and heat pump installations falling below performance estimates. The extent to which the RHI has provided an incentive for DH developers is unclear as DECC’s official statistics do not differentiate those applications and installations which have utilised the various sources of renewable heat via a DHN (Wilson, 2015).
The Strategic Framework and to a lesser extent the RHI, demonstrate a commitment by the UK Government to increase deployment of DH systems, recognising their potential as a vital enabling infrastructure for low-carbon heat delivery. The commitment at national Government level seems to be matched by a growing enthusiasm for DH from local Government.

2.1.4 Local Government Involvement

There are stirrings at present in the UK market with a number of Local Authorities independently seeking to explore district heating solutions. Through contact with Edinburgh University an interesting movement has come to light. Dr David Hawkey, a Research Fellow at the University, stated that a research project (Heat in the City) which looks at addressing some of the non-technological barriers to DH uptake, has led to the creation of a ‘Vanguard’ of those interested in DH (Hawkey, 2011). The Vanguard members consist of LA’s at differing stages of DH development from high-level initial feasibility work, to commissioned DH schemes (Hawkey, 2011). It is clear that a number of LA’s are viewing DH as a means of moving towards a sustainable system of energy supply, reducing their carbon footprint and alleviating Fuel Poverty. Russell (1993) surmises that the failure of many early DH projects can be attributed to the fact that LA’s to whom the responsibility for projects fell were themselves subject to close financial control from national Government, had limited resources and had to deal with competing demands. Hawkey (2013b) further supports this assertion, writing that due to centralised Governmental control LA’s have limited capacity, expertise and resources to become motivated to develop DH
projects. However, there are encouraging signs that local Government interest as well as higher level institutional support could provide a useful synergy for DH and further encourage this trend. Attempts to introduce a new technology may encounter a number of ‘barriers’ due to the entrenchment of the existing system or what is commonly referred to as ‘lock in.’

2.1.5 ‘Locked-In’

The notion of lock-in was coined to explain the dominance of certain technologies (Arthur, 1989) and has been further employed by Rydin et al. (2010) to explain the sociotechnical transition that is needed for the UK to achieve its low carbon goals. The ‘lock-in,’ it is argued, is not a technological phenomenon but is due to centralised energy technologies that ‘dominate’ the market; an issue of ‘market rules, institutional arrangement, business models and social norms resulting in a technological-institutional complex (TIC)’ (Unruh 2002, p.317). Rydin et al. (2010), however, note the potential for challenging this lock-in with action, particularly through decentralised methods at the urban scale. It is further suggested that institutions have a central role in both the extension of technological systems and through the institutional frameworks that influence TIC evolution, technological change itself (Unruh, 2000). Unruh (2000), however, writes that change at an institutional level is a slow process, due in part to the way in which parliamentary democracies are designed with multiple checks and balances at each level of Government. Indeed, implementing a DH system requires cross-departmental support which can often be difficult in LA’s which may have limited cooperation between departments (Larsson, 2006). As Unruh (2002, p.318) notes:
In general, the limits of technological change lie not with science and technology which tend to evolve much faster than governing institutions, but rather with the organisational, social and institutional changes that allow the diffusion of new technological solutions.

2.1.6 The Chameleon Role of Government

The role and nature of Government involvement in the energy market has changed throughout history; from the uncoordinated piecemeal local approaches of the early 1900’s (‘localisation’), to nationalisation and an attempt to centralise energy and development matters; to a period of privatisation and a return to the ‘superiority of ‘the market (Great Britain. The Government Office for Science, 2008).

At present, broader changes in the energy market as discussed by Helm (2007), including the need to move to a low carbon energy market, require a fundamental change in the way energy is generated, delivered and consumed. The move to deploy low carbon infrastructure could once again strengthen the role of Government in energy matters as local Councils play an increasingly active role in initiating and delivering local energy projects. Furthermore, there is arguably a need for stronger governance in energy matters if energy targets are to be met.

Bolton (2010, p.187) discusses the changing role of the LA in public matters, with Councils enjoying a greater degree of autonomy up until the 1970’s: ‘processes of deregulation and a rebalancing of power between the national and local levels have eroded this direct service provision
role’ (Bulkeley and Betsill, 2003 as cited in Bolton, 2010). Following New Labour in 1997, the relationship between local and national Government changed again to that of ‘networked community governance (Stoker, 2004). However, in the area of sustainability LA’s do have a degree of freedom; the Local Government Act and the Sustainable Communities Act (2000 and 2007) effectively give LA’s the power functionally and financially to create significant change in terms of economic, social and environmental well-being. A Council can thus incur expenditure, enter into arrangements or agreements, provide staff, goods or services etc. in the pursuit of the sustainability agenda (LEP, 2007). This act is particularly relevant for DH as it effectively allows LA’s to establish or enter into arrangements for the supply of district heat through the creation of an Energy Service Company (ESCo). Of course a LA must have recourse for ‘best practice’ in any such endeavour (Section 3, Local Government Act 1999) (LEP, 2007). Local Agenda 21 (LA21) the strategy and action programme for local level implementation of sustainable development) has also provided LA’s with a greater role in promoting sustainability (Bolton 2010). Indeed Tuxworth (1996) writes of a strong LA response to LA21.

As of 2010, a LA in the UK can now benefit from the sale of renewable energy due to an amendment to the Local Government (Miscellaneous Provisions) Act 1976, leading to a supposed ‘local power revolution.’ The original purpose of this Act was to empower Councils to develop District Heating (DH) schemes. As such, a LA is in a unique position to instigate and support a DH system as supported by BRE et al. (2013). However, it must also be appreciated that LA resources are under increasing pressure due to national financial cuts, as such the capacity to deliver energy projects may be under strain (Great Britian.HM Tresury,
BRE et al. (2013) also state the need for a stronger planning framework to support the development of DH.

2.1.7 Public Sector Commitment & Risk Reduction

Haney and Pollitt (2013) examine the new and on-going role of the public sector in energy matters, in terms of traditional forms of public ownership and new forms of public involvement, in spite of the continuing trend towards privatisation of energy concerns. It should be noted that almost every DH scheme in existence has had the support of the public sector (LEP, 2007). This is an important consideration as a Local Authority can assist a burgeoning DH scheme in a number of central ways. The connection of key public buildings helps to create confidence locally in the system and encourage private sector connections. Securing core (public) anchor loads is vital for the economic viability of the scheme (Summerton, 1992). Kelly and Pollitt (2010) suggest that the benefits of public sector cooperation go beyond simply sharing risk. For example a LA may support a project through a monetary investment or planning support and in return may benefit from improved environmental performance of its buildings and alleviation of FP for residents. A Council may also influence aspects of network development and operation such as pricing, in order to provide assurances to potential customers of fairness (Hawkey, 2009).

Hawkey (2009), however, points to the fragmentation of local governance as a coordination challenge to a DH project. As Bulkeley and Kern (2006) in Hawkey (2009) notes, DH ‘cross-cuts’ the traditional separations within LA’s. This view is supported by Larsson (2006), who writes of the lack of joined-up thinking within LA’s as a barrier. The DH
system builder must effectively unite the necessary internal factions, building a supportive coalition to develop the DH project.

Although public sector support is considered vital to a scheme, there is some discrepancy over the suitability and need for higher level intervention in the market place. Kelly and Pollitt (2010) argue that grant support isn’t necessarily the answer to increasing the uptake of DH schemes; they propose that one must instead focus on the ‘systematic long-term risk’ that hinders investment in DH. A view supported by Hawkey (2009). Writing some years previously, Rüdig (1986) proposed that DH/CHP expansion based on continuous Government intervention is unlikely to be successful in the West, further writing that prolonged Government subsidies are bound to be unstable and insecure.

2.1.8 To ‘Grant’ Support or Not to ‘Grant’ Support?

The exact role of the public sector in each DH system will naturally be dependent on the context of the specific project. However, whilst the need for more Government support for DH has widely been acknowledged (Rytoft and Strömberg, 2009), the exact nature and form of direct intervention in the market place is a contested issue.

Hawkey (2009) suggests the need for a ‘National Champion’ who through the promotion of standardised contracts could help to reduce set-up costs. The National Champion, he argues, may be more effective than ‘periodic bursts of grant funding’ (Hawkey 2009, p. 57). This is contrary to Larsson (2006) who suggests the need for a grant or subsidised capital scheme. However, Pöyry (2009) argues that grants for capital funding should be designed to demonstrate the feasibility of installing a DH network, as well
as to provide the catalyst for cost reductions and the development of a local supply chain.

The recent policy by DECC (the Strategic Framework for Low Carbon Heat) proposes instead an expert ‘think-tank’ (the Heat Networks Development Unit) and a funding stream for technical and feasibility reports. The funds are not for the construction of a system, rather they provide assistance up to the point of commercial development. The emphasis is on developing strong commercial projects that are worthy of investment without grant support, representing a growing institutional support for DH and also a change in the way institutional support is provided.

Clearly a key issue for the DH sector in the UK is the high upfront capital cost associated with the infrastructure. However this must be viewed on a whole life basis, factoring in displaced fuel cost, mitigated boiler replacement and maintenance needs. In particular, for commercial buildings additional benefits such as the space gained where once an individual boiler would have stood and reduced green tax burden need to be emphasised. A narrow focus on private cost-benefit should also be avoided, as proposed by Hawkey (2009), who argues instead for an integrated view that considers wider economic benefits such as local resource utilisation, job creation and social benefits. In this sense, timing is crucial; if DH can be tied into refurbishment, those customers who need heating system upgrades would present a better economic case, as supported by Summerton (1992).
Larsson (2006) further argues that the private cost of DH incurred by investors/system builders far outweighs the benefits to society of installing the technology. It is proposed that Government should take action to subsidise DH and CHP in order to avoid market failure, which occurs due to the presence of externalities from standard electricity and heat production. Thus, Larsson (2006) suggests, contrary to Hawkey (2009), that companies should be subsidised through low-interest loans or investment grants. In addition, it is further proposed that homeowners and businesses could be offered grants, assistance or technical equipment to ease the change from conventional heating systems to DH. Furthermore, the use of low-interest loans and subsidised capital has been employed as an effective means of increasing interest in DH in Sweden (Mahapatra and Gustavsson, 2008).

The notion that public ownership reduces the financial risk of a project through lower public sector borrowing rates and the ability of public bodies to reduce the amount of equity in their business is questioned by Haney and Pollitt (2013). It is argued that perhaps the perceived risk reduction relative to private ownership is in fact simply shifting the risk onto those who are far less able to manage the risk than private investors i.e. the taxpayers. Some have suggested the need for more stringent measures, including mandating the connection of public buildings and an increase in standards for power generation to improve efficiency through utilisation of waste heat (Haney and Pollitt, 2013).

All schemes developed within the UK have relied on the strong support of the Local Authority (Rytoft and Strömberg, 2009). Amongst the key LA roles defined by Bolton (2010) as critical is the commitment of the connection of public buildings, as an important way to reduce the off-take
risk associated with estimating the demand for heat. These public sector buildings act as key ‘anchor loads’ to a burgeoning DH system. The LA, irrespective of their degree of financial investment, plays a key role, adding institutional weight (‘legitimacy’) to a DH project (Hawkey, 2009), as well as fostering a spirit of cooperation between stakeholders. The nature of the Government support required is debated, however the latest policy on DH may offer more profound market changes (Great Britain. Department for Energy and Climate Change, 2013). The policies seem indicative of a growing institutional base for DH. Of course as Helm (2003, p.1) states, “Energy policy is a process, not an outcome, which adapts to the changing objectives and priorities, and to the nature of the assets….it is a prisoner of the past…..”

2.1.9 Paradigm Shift

Helm (2003) suggests that a ‘paradigm shift’ is taking place with regards to Energy Policy. It is suggested we are moving away from a stance of ‘sweating the assets,’ typical of the 1970s and 1980s, to one of investment. The country’s ageing gas and electricity network, as well as coal and nuclear fired power stations, may be considered the symbol of a different time, a time which emphasised the superiority of the market. As Helm (2003, p.3) further writes, “Government has relegated competition and markets to their rightful role as important instruments in achieving the objectives Governments set.” Competitive markets are no longer an adequate means by which to tackle environmental concerns; a radical shift in policy is required. Great Britain. The Government Office for Science (2008) also supports this claim, writing of the difficulty in
changing a policy designed to meet the needs of yesterday’s society.

The carbon economy of previous years must now effectively be replaced and the assets and infrastructures must be upgraded or replaced to fit the changing objectives; the move to a low carbon economy. These changes include upgrading and balancing the national grid; as Helm (2003) notes that the current electricity system is designed to take bulk supplies at high voltages from centralised stations down to lower-voltage customers, renewables necessitate the opposite. The intermittency and reliability of renewable energy is a major issue and the Government is now attempting to promote and develop an appropriate mix of energy systems, of which nuclear power is to play a part. Unruh (2002) stresses the importance of building flexibility into the future energy mix, stating that a new technology should not be seen as ‘the’ solution to the climate problem. Naturally these new technologies will require new infrastructure and bring with it changing consumer practices. Namely the purchase of energy from a (potentially) unknown energy supplier on a much lengthier contract, and hence, on a much less flexible basis than current arrangements. As Veneables (2013) discusses, ‘user’ aspects of new technological systems should not be ignored or underestimated.

2.2 Cultural Bias

2.2.1 Acceptance of District Heating

The acceptance of a new technology is an issue of customer culture and social behaviour (Rytoft and Strömberg, 2009). As purported by Upham and Jones (2009) opinion is shaped by individual context and informed
by past experience, as much as by the knowledge and information that consumers have access to. Markusson et al. (2012) further states that ‘public acceptance’ is a critical factor influencing the successful development and diffusion of new technologies. As Summerton (1992) acknowledges the ability of the system builder to attract subscribers is one of the most crucial tasks. Hawkey (2009) further notes that the decision of prospective customers is crucial in shaping the configuration of a network. The following section considers a selection of core influencers on the prospective subscriber base; the role of past experience in shaping DH opinion, the prerogative of ‘individual’ choice in energy markets and the degree of knowledge and awareness of DH.

2.2.2 Historical Experience

DH or ‘Community Heating’ (CH) schemes were introduced in a number of social housing estates throughout the UK during the post-war years, a view supported by Gardner (2010). Russell (1993, p.37), also writes of how the devastation wrought on cities following the 2nd World War brought with it an opportunity to ‘introduce innovative and improved infrastructure and services.’ At the time, fuel shortages and the efficient use of energy were primary concerns, as was support for greater intervention in the economy and improved living conditions (Russell, 1993).

As Russell (1993) writes, the mid-1960s saw a renewal of interest in DH systems with uptake peaking in the mid-1970s. DH was viewed as a way of delivering higher heating standards, improved air pollution levels and
cheaper heating, somewhat incidentally given the lack of socially defined objectives for the period or general concern over energy conservation (Russell, 1993). The interest coincided with a new phase of housing construction, typically high-rise flats or system-built, as well as the planning of new towns and expansion of cities (Russell, 1993). DH thus, seemed to resonate with the ‘spirit of the times.’ However, design installation, performance and operational problems led to much disappointment amongst users and Authorities alike. Indeed, according to former tenants of a DH scheme in Wales, a major problem was the metered payment system (Participant 1). Evaporative heat meters were used which were seriously inefficient. One former tenant felt that the system offered sufficient control over the temperature but the metering system proved very expensive (Participant 2). As Participant 1 notes, “Customers found the system difficult to operate; opening windows would be a common way of regulating temperature.”

Larsson (2006) also writes of the poor design and maintenance of the early schemes. Indeed one interviewee in Larsson’s study goes as far as to suggest DH as a ‘poor man’s choice’ (Larsson 2006, p.38). Although, not all early schemes faltered; the Newport City Homes DH scheme in South East Wales (the largest in Wales) (Participant 6) is still in existence, serving over 1000 social housing properties on the Duffryn Estate, Newport (Participant 3). The system has undergone no major changes since the scheme was established, regular servicing and maintenance (with a well-established DH contractor) have enabled the system to operate in good condition (Participant 12).

Indeed, whilst the major building activities of the 1960’s and 1970’s presented what seemed like an ideal opportunity for the expansion of DH,
technical problems and the relative success of the gas and electric industries halted DH’s expansion. Most of the Council house market was captured by the electricity industry mainly due to the lower installation costs of electric heating and due to the safety issues of installing gas in high-rise flats. Conversely, DH development in some parts of Europe, namely Sweden was increasing as efforts to move towards sustainable heating systems grew (Participant 7).

2.2.3 Active Institutional Resistance

Those who saw the potential in DH were frustrated by its lack of progress and led some to consider a deliberate ploy on the part of the energy industries and related Government departments (Russell, 1993). The personal interests of those in the electricity industry who viewed DH as a disruptive influence to the status quo of electricity provision, is certainly made apparent in Russell (1993) in which he discusses the neglect of DH/CHP in Britain. As Russell (1993), points out the market failure argument is insufficient in providing a full explanation as to the neglect of DH (and CHP), physical and organisational barriers were evident.

The successful scheme at Pimlico was considered a ‘major headache’ for the British Electricity Authority (BEA) (Russell, 1993). The BEA, as well as the controlling Westminster City Council, worked to limit the positive impact of the scheme, showing a reluctance to provide information on operating costs or promote its merits in public, Russell (1993, p.53) terms this ‘active resistance.’

Support for CHP/DH in general did exist and emerged from a variety of sources, including local and national campaign groups and metropolitan...
LA’s, with DH seen as an ‘alterative strategy for local government and energy provision’ (Russell 1993, p.47). As Russell (1993, p.47) writes,

*Alliances around CHP/DH were strange: support came from Left and Green parts of the political map, but also from sections of the Right which saw the roots of neglect of CHP/DH in centralised state control of energy and lack of competition.*

What is consistent throughout Russell’s (1993) account is the lack of an institutional grounding for CHP/DH, with existing organisations, who due to their own vested interests in existing systems, were wholly inadequate to support the integration of this new technology. This reinforces the notion of DH as a complex sociotechnical system in which the incumbent system must effectively be dislodged in order for DH to prosper (Summerton, 1992). This will require an appeal to the potential subscribers (customers) of DH.

### 2.2.4 Requirements of Subscribers

Through researching early Welsh DH schemes and interviewing former tenants of a scheme installed in the 1960’s, it is clear that those who have experienced early DH systems found the technology vastly inefficient at delivering the required comfort levels (Participant 1). This is a view supported by Pöyry (2009), who stresses the importance of emphasising the reliability and efficiency of modern schemes. Certainly overcoming the legacy of the early DH schemes is important in order to instil trust in the general public (Rytoft and Strömberg, 2009). Rytoft and Strömberg (2009) suggest that DH needs to shake off its old image and develop a
new identity. Hawkey (2009) echoes this sentiment, noting that time has passed since the early inefficient systems but suggests emphasising the high degree of service associated with modern DH schemes as a way of overcoming the potential problem of early experiences and a lack of awareness.

2.2.5 Customer Choice

The British public are currently used to the power of individual choice in the energy market (Henning and Mårdsjö, 2010). At present, however there is growing discontentment with the existing system due to the rise in fuel costs (Ofgem, 2013) and complex, hard to decipher fuel bills (Mummery and Cooper, 2011). There could arguably be a growing appetite for alternative systems which offer a change from the status quo.

However, Henning and Mårdsjö (2010) state that a key barrier for DH in the UK is the fact that DH is not a ‘natural’ or normal energy choice, inferring that DH is a social as well as a technological matter. Contrary to stand-alone heating systems, connection to a DH scheme is essentially a natural monopoly, with customers tied in for periods of approximately 20 years, which means that customers are unable to switch energy supplier in the same way one could for gas or electricity. Instilling consumer confidence and protecting customers is of vital importance. As Summerton (1992, p.161) states, “The strong points of DH must match the vulnerability of individual systems.”

The buy-in of the potential customer is critical to the development of DH
schemes (Rytoft and Strömberg, 2009). There have been numerous studies on those issues that influence Swedish homeowners to adopt heating systems, as acknowledged by Mahapatra and Gustavsson (2008), who undertook a study of public attitudes on innovative heating systems in Sweden. By contrast the only academic work to date on public opinion of DH in the UK is undertaken by Upham and Jones (2010), who examine public opinion of DH through two focus groups of mainly elderly participants, as well as a postal questionnaire of a community within South Wales.

As discovered by Upham and Jones (2010), concerns over being locked-in to the network and the possibility of price rises were key issues. Trust in the supplier was also considered highly important, with preference for a well-known supplier. The participants also displayed a general mistrust of private suppliers which one participant perceived as ‘profit-orientated.’ The idea of a ‘British Energy Company,’ who could own the DH system and ensure national autonomy, was met with a favourable response. Interestingly, the participants viewed the notion of centralised control in the energy market as a positive idea, equating the public sector with trust and legitimacy. Some form of protection over the supply contract was deemed highly important. The two most vital issues within contractual/operational concerns were that of price and a secure contract. Consumer protection was likewise highlighted as of critical importance in BRE et al. (2013), particularly, the need to address disconnection policy, transparency of billing and consumer protection. Hawkey (2009) further writes of the London Development Agency’s (LDA) work through the Distributed Energy Delivery Team (DED) in developing a Customer Charter and a Technical Guide, to ensure particular technical standards are met. The Charter aims to protect connected consumers in the
absence of heat market regulation and covers aspects including reliability and health and safety. As Hawkey (2009) notes, many DH operators offer these guarantees as a matter of course. However, the benefits of a clearly defined Charter may reduce the burden on resources for new schemes seeking to offer guarantees and could be a “widely recognised way of dealing with customer protection issues” (Hawkey 2009 p.28). Bertoldi and Rezessey (2006) also suggest standardised contracts in terms of ESCo operation to be of benefit in increasing transparency and boosting consumer confidence. The idea of recognised standards for DH in the UK could offer greater consistency in terms of the quality of service offered and reassure customers that a recognised industry-wide standard is being achieved. This is something that DECC is now considering as part of its energy strategy.

Upham and Jones (2011) state that a move to a DH system would need to involve minimal change in terms of habits and routines. Respondents were asked to consider how favourably they viewed four features of a DH scheme: temporary disruption, the installation of a small-heat exchanger, being tied into an energy contract for 12 months and being tied into an energy contract for 24 months. The offer of economic compensation in the form of lower heating bills was deemed pivotal in each of the scenarios in Upham and Jones (2011).

2.2.6 Subscriber Motivations

Cost was deemed a primary motivator in Upham and Jones’ study with many participants having switched existing energy supplier during the last few years seeking a better deal. Upham and Jones (2011) noted that environmental considerations were a low motivating factor. This is
supported by Rytoft and Strömberg (2009) who discovered that customers were generally uninterested in where their heat came from and were as such unmotivated to change their heating system. This is further echoed in Vinterback (2000) who examined the reasons for homeowner’s adoption of pellet boilers; economic motives were a primary driver for the choice of heating system followed by environmental reasons.

The tendency for individual solutions to heating needs could pose a potential barrier to DH; consumers in the UK are accustomed to individual solutions, such as stand-alone gas boiler systems which are located in their homes. This system enables considerable freedom of choice allowing as it does the switching of heating/energy supplier with relative ease. However it must be appreciated that there is rising discontent with the current energy system and the dominance of the ‘big six’ energy players, as such the level of real choice in the market is debateable. Greater access to information could play a key role in increasing support for green energy technologies as suggested by Zarnikau (2003) and help to engender more informed decisions on energy options (Mahapatra and Gustavsson 2008). Although as Borchers et al. (2007) who investigated the willingness of consumers to pay for certain energy (power) options by source type indicate, certain green energy sources may be more acceptable than others. Biomass and farm methane were found to be least preferable in comparison to generic green energy or solar. As such, there are important considerations surrounding the ‘green consumer’ and oversimplifications should be avoided. The movement could, however, prove important for those seeking to increase awareness and acceptance of DH and rests on a carefully devised marketing plan.
2.2.7 Marketing District Heating

Mahapatra and Gustavsson (2008) illustrate the important role that a well-thought out and focused marketing campaign can play in attracting and securing potential DH subscribers. In the case of Swedish homeowners, a Government grant significantly altered participant’s perceptions of cost and the promotion of DH as a sound environmental solution reassured the group of their reduced environmental impact. A view supported by Larsson (2006), who writes of the lack of positive marketing as a major barrier for DH and CHP technologies. He suggests that the benefits of both are virtually unknown by the general public, most commercial entities and by Local Authorities. Dieperink et al. (2004) in Mahapatra and Gustavsson (2008) propose that ‘need’ is a precondition for the adoption of a new heating system. In the case of Mahapatra and Gustavsson (2008), the impending Government investment subsidy engendered the creation of a need for DH. The process of ‘winning over’ prospective customers is time-consuming, requiring extensive negotiations and many layers of decision-making within each respective organisation (Summerton, 1992).

The importance of the marketing strategy in influencing connection was detailed in Summerton (1992) who cited the significance of developing strategies for convincing subscribers. Further stating that connecting to a DH system requires considerable consumer adjustment to the ‘new concept, new procedures and new roles’ (Summerton 1992, p. 150). Key aspects of that strategy included targeting those buildings whose heating systems were ageing and approaching replacement; high reliability and low maintenance requirements become more appealing when a
customer’s current boiler is ready to be replaced. This is what Summerton (1992) deemed as the matching of timelines of complementary supplier-consumer concerns; “Being at the right place at the right time it seems is important in respect to the very old and the very new” (Summerton 1992, p.161).

In Summerton (1992), high density users and anchor loads were connected as a matter of importance. Economic compensation was offered on a negotiated basis for dismantled heating equipment, noting that financial incentives including ‘market value’ tariffs, Government loans and grants were an important tool for attracting early customers. In the case of Mjölby, the energy company made good use of its political connections in convincing particularly sensitive or important customers. A tactic was also observed for newly-acquired customers; Managers of the Energy Company would positively encourage the dismantling of existing boilers in order to limit the possibility of a reversal of decision. Consumers thus become ‘locked in place.’ Interestingly, whilst being ‘locked in’ has negative implications for prospective subscribers (Upham and Jones, 2009), it is an imperative for system builders.

As Summerton (1992) writes, incumbent competitive networks must be displaced. One can draw a comparison between the incumbent electricity market in Mjölby and the existing gas network in the UK; both are competitors to DH’s market expansion. However, by cleverly integrating the new DH operation with the existing electricity department competition between the two markets was avoided. Alternative heating options, which were viewed as a threat to long-term economic viability and the legitimacy of the system, were actively limited in Mjölby, as was the case in the refusal to supply electricity to a resident’s heat pump.
(Summerton, 1992). Though, as appreciated by Participant 6, DH is not a panacea and will not be appropriate in every circumstance; DH system builders must be pragmatic and realistic in their expectations of DH.

By contrast, there exists little detailed information on how to effectively promote DH in the UK. More generally a criticism towards the SST school of thought has been its relative neglect of the ‘consumption’ of technology, and the characteristics and role of markets (as well as the requirements of users) and culture in shaping technologies (as discussed in Williams and Edge 1996). Indeed, Green (1992) in Williams and Edge (1996) note that a new technology may require the creation of a market in order for it to reach its potential. MacKenzie (1992) also discusses the failure more generally within sociology to acknowledge price or profit. In light of these assertions, the following section details the economic requirements and organisational implications of DH.

### 2.3 Organisational Constructs

The organisational aspects of DH systems are perhaps the most critical. As Summerton (1992) states, once the decision to develop a DHN has been taken, an organisational format for the new company (typically termed an Energy Services Company ['ESCo']) must be chosen. Sweden has a long tradition of public ownership in DH systems, reflective of the autonomy of municipalities and their considerable involvement in local energy matters (Participants 7 and 8). Magnusson (2013) however, notes how this position is changing, with growing private sector involvement in the DH industry. The UK DH market by contrast operates along a sliding scale of public sector involvement dependant in part on the ability
of the contracting authority to incur risk and the need to maintain ‘control’ over the desired objectives (LEP, 2007).

As acknowledged by Hawkey (2009), understanding in the area of how LA’s can engage with DH in partnership with the private sector has been developed. LEP (2007) provides a significant contribution to the field of DH ESCo understanding. Hawkey (2009) further elaborates that the knowledge of the business modelling options and potential configurations, whilst proffered by some Regional Development Agencies (RDA), is in fact only absorbed by a limited number of LA’s (Hawkey, 2009). A discussion will now be had on the determinants of ESCo ownership and structure, the current business models employed in UK DH schemes and the possibility of a movement away from a dominant private sector stake.

2.3.1 District Heating Business Models

The business model used to deliver a DH system will be driven by the economics of the project and partially by the attitude of the contracting authority to risk and control, itself driven by the overall project objectives (Participant 9). For example, should a Local Authority wish to exert a significant deal of control over the business vehicle in order to achieve long-term objectives then it may consider that a publicly-owned company is most suitable. As Verbruggen and Marcelis (1986) in Summerton (1992) suggest, public ownership can prove extremely pertinent for the prospects of success. It is further argued that a publicly owned company can ease the introduction of DH due to a suggested ability to better take into account the long-term effects and side-effects.
Verbruggen and Marcelis (1986) in Summerton (1992) further imply that a publicly-owned body, through an aspirational energy policy, can ensure that DH will not be marginalised by ‘inferior solutions or shorter payback.’ DH ownership in Sweden has long been the preserve of the public sector with two basic organisational frameworks:

- Municipal Offices
- Limited Companies

Summerton (1992) writes of the various ownership patterns within these frameworks and the advantages and disadvantages of each. Namely, public ownership can suffer from long bureaucratic processes for decision-making, a need to demonstrate public openness and a lack of independent capital. Limited companies conversely may be considered as having disadvantages in terms of public control and insight but are less constrained by the layers of bureaucracy that can hinder progress in public organisations. Certainly, as was the case in Mjölby, the ability of the public sector to attract lower interest rates was an important factor (Summerton, 1992).

2.3.2 Mixed Ownership

Summerton (1992) provides a word of caution on ‘mixed ownership’ structures suggesting that the divergent concerns, values and traditions of the parties involved can create tensions that are not always foreseeable at the outset. This is supported by Participant 9 who discussing the issue
states, “Just like a marriage, choose the wrong partner and it’s painful for everyone.” The LA’s that choose to split responsibility with the private sector have a considerable decision to make. The decision is largely shaped by their governing objectives and financial capacity (Participant 9). Participant 10 stresses the need for both to be ‘on the same page’ in terms of the objectives of the project and what is being set out to be achieved (Participant 10). Participant 10 emphasises the need to select a commercial partner with strong capabilities, “It is imperative to select a strong delivery partner with a proven track record who is capable of making the tough investment choices.”

As Summerton (1992) purports, selection of the ‘right’ business delivery model involves weighing up the pros and cons and assessing the compatibility of each structure with local political objectives, the existing structure of the municipal organisation, in-house capabilities and resources, as well as municipal traditions. In the case of Mjölby, the organisation was purposely kept as small as possible, with much construction work typically undertaken in-house in order to minimise costs as far as possible. External consultants provided technical expertise and much effort was taken to learn from these experts in what Summerton (1992) calls ‘successive organisational learning.’ Indeed the ability of system builders to create access and exploit expert knowledge may be pivotal to successful attempts at introducing DH, particularly in light of the limited LA knowledge of DH.

Business models in the UK, by contrast, operate along a sliding scale of private sector involvement; some like Aberdeen Heat & Power maintain a public grip whilst simply employing external consultants for design aspects, whilst schemes including Birmingham and Southampton
operate a ‘Joint Cooperation Agreement’ in which the private sector retains the financial and technical risk (LEP, 2007). UK DH ESCo’s can be:

- Public sector driven

- Public sector driven (with private sector involvement)

- Public sector driven (procured and operated by private sector, though not fully on energy performance contracting principles)

- Public or private sector driven (operated on energy performance contracting principles)

- Private sector driven with (or without) public sector encouragement (LEP 2007, p.2)

There is no single standard definition for an ‘ESCo’ as acknowledged by LEP (2007). Okay and Akman (2010, p.2760) define an ESCo as “a private-sector instrument established to guarantee and deliver energy improvements to their clients, with an ESCo’s remuneration tied to the improvement in energy performance achieved.” LEP (2007) describe an ESCo more simply as, ‘An entity involved (actively procuring/managing/operating) in energy efficiency, energy savings, CO2 reductions.’

Typically an Energy Service Provider Company (ESPC) will be paid a flat rate fee or provide the service through ‘added value’ with the supply of
equipment or energy. ESPC’s may have some incentive to reduce energy consumption but they will not be as clear as in the case of ESCO’s. An ESPC will typically not be subject to a performance clause as an ESCo would be, this is mainly due to the fact than an ESPC will generally be involved in primary energy conversion equipment, such as boilers and CHP systems, and exert no control over the efficiency of secondary conversion equipment (radiator etc.) or influence the demand for final energy services itself (space heating, light etc.).

An ESCo can, however, have important distinguishing factors:

- ESCo’s guarantee energy savings or the supply of energy at a reduced rate (achieved through implementation of an energy efficiency programme)

- The remuneration of ESCo’s is implicitly linked to the energy savings delivered- either in whole or part

- ESCo’s typically finance or arrange finance for their projects by providing a savings guarantee

- An ESCo will maintain an on-going operational role in the project through the contract life measuring and verifying savings

Beroldi and Rezessy (2005, p. 17-18)

NEA (2010) discusses the issue of whether an ESCo needs to operate under an EPC and suggest that during their study there was an inconsistency. NEA (2010) further advocate that ESCo use of public
money should include an aspect of performance contracting; district heating schemes have the potential to assist in the fight against fuel poverty, writing this into a contract it is argued, maybe the most secure way to ensure this happens. Indeed, in her thesis, Austin (2010) highlights the potential for DH to reduce FP in the UK. Likewise, both Participants 4 and 5 suggest that Fuel Poverty aspirations could be an important driver for DH in the UK.

2.3.3 Structure

The particular organisational structure chosen very much depends upon the specific project in question and will amongst other things depend on the:

- Attitude of the contracting authority to control, tied in to the long-term objectives of the Authority

- Cost (project economics and the projected Internal Rate of Return [IRR])

- Degree of knowledge and experience within contracting authority on energy matters

- Construction and operation of a single facility/ range of energy efficiency matters

- Attitude of contracting authority to risk (LEP 2007, p.6)
Through the Edinburgh University project, ‘Heat and the City’ and the creation of a vanguard of those parties interested in DH an interesting development in DH business model ownership has come to light. According to Hawkey (2012) some Local Authorities are investigating the possibility of working in partnership with neighbouring Authorities using local low carbon funds. The investment vehicles would draw together Allowable Solutions payments, as part of the Code for Sustainable Homes, along with private sector investment, to support a range of strategically selected community-scale projects. This would enable knowledge-sharing and the pooling of resources, which could engender a greater level of bargaining power in negotiations with the private sector.

2.4 High Investment

A report to the Department of Energy and Climate Change undertaken by the consulting firm Pöyry (2009), examined the barriers to a greater uptake of District Heating in the UK. The significant upfront capital cost and the high risk associated with the schemes were dominant issues. This is supported by writers in the field including Kelly and Pollitt (2010), Hawkey (2009), and Toke and Fragaki (2007) and reinforced by BRE et al. (2013).

Hawkey (2009, p.31) acknowledges the Pöyry study, as well as other Government studies, as relevant in directing policy-makers attention towards DH and attracting international investment interest in DH.
Hawkey does however advise caution over the narrow private cost-benefit analyses used to determine feasibility in many of these studies. CHPA (2008) in Hawkey (2009), also criticises the organisational model taken as an assumption in these studies, which ‘isolates aspect of heat supply in contrast with a more integrated approach.’ In spite of these criticisms, Pöyry (2009) make a number of relevant and important points in their study which shall be examined in further detail throughout this section.

The upfront capital costs of DH systems are high, particularly where a new heat mains or boiler house is required. Pöyry (2009) stress the importance of utilising whole life costing, in order to obtain an accurate picture of the capital, operating and running costs, as well as revenue over the life of the system. In addition, the use of revenue from the sale of heat could also be used to attract private finance. However, the capital cost can be affected be a range of factors.

A particular issue with building a DH system is the need to specify capacity levels whilst signing up the customer base. As acknowledged by Summerton (1992), over-specifying capacity is costly whilst under-specifying is also costly. In addition, consumer response, levels of consumption change and new competitive technologies can all undermine competitiveness. Timing is also a crucial issue; Pöyry (2009) state that it is most cost effective to introduce DH when the existing system needs to be upgraded/replaced, as supported by Summerton (1992). Through influencing consumer opinion and garnering support and commitment, system-builders can help to reduce the uncertainty that contributes to high investment risk.
Rytoft and Strömberg (2009) suggest that the financial downturn has adversely affected the development of DH schemes, citing the lack of property developers keen to invest in new projects. Indeed, Haney and Pollitt (2013) discuss concerns within the energy sector that private capital markets may not be able to meet the rising investment requirements of the sector due to the global financial crisis, particularly true of investments which rely on politically vulnerable Government support incentives. However, Chiang et al. (2010) contend that the energy sector has weathered the economic storm remarkably well. The Energy Management Services outperformed other segments through a 30% growth rate, with estimations that should the growth continue the energy services market will be worth £6.5bn by 2020 (Chiang et al. 2010).

2.4.1 UK Conditions

In comparison to European costs, estimated UK civil costs, such as excavation of trenches, backfilling and reinstatement of road surfaces, are more than double those in European countries (Pöyry, 2009). This is supported by Austin (2010) who compares the cost for a hectare of DH piping of DH installations in Reykjavík Iceland, (based on 3 areas within the city), to the Lerwick DH scheme in Shetland and discovered a factor of 10 price differential. It would seem a key influencing factor which goes some way to explaining the contrast in cost estimates is the fact that DH was developed as the city of Reykjavík grew, and was installed during the new build phase. These costs are also attributable in part to the lack of experience in laying DH mains in the UK and the subsequent high risk premium attached by contractors (Pöyry, 2009). Traffic management
costs are also higher in the UK than in Europe according to Pöyry (2009). This is further supported by Participants 7 and 8 who state that an increase in more experienced Swedish contractors in the UK marketplace could help to generate lower cost estimates for DHN construction. Although Participant 15 warns against making generalised assumptions on DH piping costs. He advises that the cost of piping is highly context-specific, contingent on the design and size of the DHN and dependent on:

- Mains Cost
- Ground type
- Installation
- Configuration
- Building Density
- No of connections

Naturally retrofitting DH schemes to existing buildings will be a costly option as supported by Rytoft and Strömberg (2009). However the installation costs per dwelling will be cheaper for ‘new builds’ the mains can be installed at the same time as other services. The cost of the heat mains can often be offset against the cost savings from not installing gas mains to each property. In addition, other building management benefits should be promoted included the increased space available within the building due to the fact that there is no longer a need for an individual boiler. Also, the use of ‘green’ heat could be a potentially attractive offering particularly for a commercial entity that may be subject to ‘green taxes.’ Larsson (2006) suggests that Swedish DH customers are happy
with DH’s ‘green’ image.

The density of the housing to be supplied and hence the length of the heat network will affect the capital cost, as supported by Summerton (1992). DH schemes supplying blocks of flats or terraced homes are likely to be more cost effective than supplying a number of detached homes. The size of the system also affects the system cost; the larger the system, the cheaper in terms of capital and running costs the heating cost per dwelling will be due to the potential for economies of scale in the purchase of capital equipment and fuel. Some of the costs associated with a central energy plant will be relatively insensitive to the number of dwellings served (Pöyry, 2009).

Kelly and Pollitt (2010) cite high upfront capital costs and high risk as two key deterrents for private investment in DH, identifying the most important factors contributing to that risk as a ‘lock-in’ of existing power and gas infrastructure, significant upfront capital, energy price volatility and uncertainty over future regulation. An important conclusion drawn is the effect of collaboration between public and private bodies in order to reduce the risk (both technical and financial). A Joint-Cooperation Agreement (JCA) for example, regulates how the parties can share the risks in the most appropriate fashion with the public sector ensuring that public buildings act as anchor loads and also providing Planning and infrastructural support (LEP, 2007). BRE et al. (2013) further acknowledge the central role LA planners play through supporting the development of heat networks via the planning process. However there are suggestions that planning frameworks are not sufficiently robust or supported through planning guidance to enable full encouragement of heat networks. The Government will now be looking at the need for
practical guidance in support of national planning policy on low carbon and renewable heat networks (Great Britain. Department for Energy and Climate Change, 2013). The cost differentials between the UK and its more DH-aware Scandinavian neighbours can in part be attributed to an immature market in which the necessary skills are not diffuse (Pöyry, 2009).

As can be seen, the economic and technical viability of DH systems is dependent on a number of key factors; the presence of large consistent heat users, the appropriate density and mix of customers, the sign-up and commitment of the Local Authority and public sector buildings and ideally, the availability of waste resources for fuel utilisation. In spite of the recent economic downturn (Finney et al. 2012), Government support for DH could increase confidence in the market for DH. However, the level and access of information available in the market place and the domestic DH skills base present specific challenges to a greater uptake of DH.

2.4.2 Knowledge & Domestic Skills Base

The issue of awareness and understanding of DH is important on two separate levels. Firstly, the issue of the level of skills in the domestic market is of crucial significance to the deployment of ‘innovative’ technologies (Locke and Hewlett, 2014). The education/skills level is an important influencing factor on project economics; the lack of experience and knowledge of DH implementation means UK contractors attach high risk premiums to schemes, this in turn affects the capital cost and hence the financial viability (Pöyry 2009). It also links to public
perception of DH and a lack of understanding and awareness of DH that in turn affects the propensity of customers to connect to a scheme.

It is generally assumed that expertise in DH in the UK is lacking (Pöyry 2009) and there is a tendency to ‘import’ skills from Scandinavian nations, this is a view supported by Rytoft and Strömberg (2009) who write of the lack of skilled engineers and contractors in the marketplace. Indeed, in their study one manager of a UK DH scheme blamed the lack of skilled contractors as hindering the expansion of the scheme (Rytoft and Strömberg 2009, p.88). Although Participant 14 dismissed any concerns over the availability of the relevant engineering skills, suggesting that strategic thinking posed a greater barrier; namely funding and policy issues as the key factors preventing the general uptake of DH in the UK.

The issue of a sufficient level of DH expertise in the market place is part of a wider concern over the importance of addressing the green skills agenda, as appreciated by Jagger et al.(2013), who argue that failure to fully appreciate the importance of a low carbon skills base could seriously hamper the transition to a low carbon economy. Locke and Hewlett (2014) discuss in their paper on the development of low carbon training courses in Wales, the need for a collaborative approach between academia and industry to meet the demands of the green skills agenda. However, as found by Locke and Hewlett (2015), securing the full participation of industry employees in even free low-carbon training courses can be a difficult task.
2.4.3 Concentration of Knowledge

Larsson (2006) suggests that lack of information is a major barrier for uptake of CHP and DH in the UK, with one study participant suggesting that the big market players hold sufficient information about technical options and possibilities, but the industrial sector and LA’s have very little DH experience. The need for greater access to, and diffusion of, knowledge is also recognised by Hawkey (2009). In addition, BRE et al. (2013) discovered a need for LA assistance with interpreting and understanding prepared technical reports. The HNDU has an important role to fill in this respect, acting as what Pöyry (2009) termed a national ‘Champion’.

BRE et al. (2013) suggest that the number of companies and individuals that specialise specifically in heat networks in the UK is small, further acknowledging the difficulty in obtaining a full picture of the supply chain industries as there is no requirement for heat network developers or installers to register officially.

Rytoft and Strömberg (2009) found that almost all developers of DH in the public sector would prefer the use of a Scandinavian consultant, quoting the Project Champion of the Lerwick DH scheme, who would not use a UK company if it did not have Scandinavian/Nordic expertise. This would suggest that a higher degree of trust may be placed in the more experienced European DH companies compared to domestic companies.
2.5 Chapter Conclusions

The chapter has provided an understanding of the broader context of the UK DH Champion, highlighting the key sociotechnical features of DH that are relevant to DH system builders. As purported by Bijker et al. (1987) and Sauter and Watson (2007), it may not always be useful to separate elements of the ‘seamless web,’ however, for analytical purposes some of the key sociotechnical features of district heating have been delineated. It is appreciated that these features are not static in nature, rather they are dynamic, particularly in relation to the policy objectives of governing parties. As such, efforts have been made to incorporate as much relevant contextual issues across cases as possible. The changing political agenda has meant that LA’s now have access to funding support for DH feasibility studies, if application criteria is met, which could have a positive impact on the emergence of DH champions. DH is viewed by a significant number of Councils throughout the UK as a potential energy solution for their area (Hawkey, 2011). Although, it must be appreciated that not all of these projects will necessary lead to the introduction of DH, the fact that they have demonstrated potential commercial viability is a significant factor, particularly in light of the high investment required. The very fact that renewable heat has been given national policy attention is a significant fact in itself. The growing instutional support for DH is independently matched by a number of LA’s considering DH as a sustainable energy system for their areas (a trend that occurred prior to the introduction of the HNDU funding allowance). Edinburgh University’s Vanguard of DH members is indicative of a growing interest in DH across LA’s (Hawkey, 2011). Councils have a particularly important role to play in developing DH systems, acting as key anchor loads, supporting the system locally in a legitimising capacity,
and in some cases, financing its development and operation.

The HNDU funding allowance could represent an important enabling factor for the emergence of LA champions. However, whilst the pivotal role of the LA is widely acknowledged, scant attention is given in the literature to those crucial system builders who drive forward the DH agenda within the Council, the DH Champions. The significant role of the UK DH Champion has been alluded to in Rytoft and Strömberg (2009), Hawkey (2009) and Bolton (2010). However, no in-depth study has been made of these crucial individuals, their background, history, education and skills profile, their personality features and crucially their motivations. If one can shed light on these aspects it may offer useful insights into the actions and strategies of those who successfully develop DH systems, which will be of high relevance to future DH system builders.

The literature has hinted at some of the important organisational features of DH implementation, namely the supposedly fragmented nature of local Government that could present a coordination challenge to DH champions (Hawkey, 2009) who need to build cross-departmental support for DH as a large-scale infrastructure project. The complexities of gaining support in this environment, as well as juggling the demands of a public service position, has not been fully examined and is worthy of further attention. If the drive for DH is to be fruitful a greater level of understanding is required of public sector DH champions. The development of an appropriate business model is likewise a considerable task, dependent on the motivations and objectives for developing DH. The system builder will need to gain access to the expert information in the marketplace that will enable an informed decision to be reached.
Gaining the confidence of the subscriber group is critical (Summerton, 1992) and an understanding of the motivations, consumer behaviour and prior experience of DH, may be central to this. Certainly, cost has been shown in the literature to be a primary motivator for energy consumers. Given that UK energy consumers are used to switching energy suppliers in order to find a better energy tariff, the ‘lock-in’ of a DH heating system presents a marketing challenge. Certainly, domestic consumers represent one subscriber group; the system builder must also convince commercial customers which could be particularly difficult given forward purchasing arrangements, and fellow public sector organisations. A DH system builder must possess the necessary attributes and skills to overcome these challenges and convince a range of energy consumers of the benefit of connecting to an unknown system. This study aims to shed light on these critical dispositional features, as well as highlighting the importance of organizational context and the creation of (organizational) social capital.
CHAPTER 3: THE CHAMPION

3.1 Introduction

This chapter reviews the literatures which examine the notion of an agent of change, the ‘champion,’ and their origins, thereby addressing the central research question, regarding the ‘how’ and ‘why’ of champion emergence. The tension between action and structure in such conceptualisations is highlighted; key themes in the literature are explored, which stem from the debate on the primacy of the individual over his/her context.

3.2 Conceptualising the ‘Champion’

The identification of the role of champion is attributed to Schön (1963), who in his study on radical military innovations, proposed that a champion was required to surmount the indifference and resistance that significant technological change can bring. The champion does this by identifying with the idea as his/her own, promoting the idea wholeheartedly through informal networks and at risk to his/her own position and reputation (Howell and Higgins, 1990). Since this conceptualisation, various academic disciplines including Organisational, Managerial and Innovation studies have sought to examine the notion of a central actor. Jenssen and Jørgensen (2004) suggest that much of the research on championing has been undertaken without a clear theoretical base. It is suggested that this may be because “no single theory provides a foundation for a comprehensive
understanding of such a role” (Jenssen and Jørgensen, 2004, p.64). However, as appreciated by Markusson (2010) there is a commonality of approach across the varying literatures in how change, be it an environmental initiative, a technological innovation or an organisational improvement, is promoted. Indeed as described by Taylor et al. (2012), the varying literatures find much in common in terms of environmental champions. As recognised by Markusson (2010) the different approaches to the study of championing can be considered as lying on a spectrum from action to structure orientation (Figure 3.1), and is reflective of an on-going debate within the literatures on the primacy of the individual over his/her context. As Markusson (2010, p.778) states, “Action oriented theories tend to highlight individual achievements and neglect contextual and historical factors, whereas structuralist theories emphasise social and organisational contexts.”
3.1 The Action-structure continuum

Figure 3.1: The action-structure continuum
The two extremes reflect the deeper sociological debate on the nature of human agency; is human agency an outcome of social structures or are social structures the result of human agency? (Giddens, 1984). As Walley and Taylor (2002, p.33) discuss, Giddens (1984) has argued that change cannot be understood by focusing solely on the traits or actions of individuals, nor can they be fully appreciated by concentrating on the organisational structures which surround them. Instead, environmental initiatives should be seen as, “Order emerging from the mutually producing relationship between action and organisation or social structure.”

Giddens further proposes that it is the repetition of the acts of individual agents which reproduce the structure: “Society only has form, and that form only has effects on people, in so far as structure is produced and reproduced in what people do” (Giddens and Pierson, 1998, p.77). Essentially, social life is not ‘merely a mass of micro level activity’ whilst answers cannot be found by concentrating on macro level explanations alone; there is a reciprocal, interactive and ongoing relationship between human agency and social structure (Giddens, 2006). Through this interpretation Giddens sought to break down the entrenched division between structure and agency (‘dual structuration’) (Giddens, 2006). Walley and Taylor (2002, p. 33), discussing Walley and Stubbs (2000), note that a ‘conceptual leap’ must be made to accept that the reinforcing nature of action and structure can extend across time and space to appreciate widespread phenomena such as the greening of society. As proposed by Markusson (2010), accounts of championing should consider both the champion and the context in order to avoid the limitations of each extreme perspective. In his study, Markusson examines both action-led and context-dependent factors investigating the
champions of environmental initiatives in the chemical and dairy industries (both in the UK and Sweden). This is achieved through exploring the expertise, interests, career histories (and formal education) of the champions, whilst also considering the organisation of projects, firms and firm-external factors (such as regulation). In doing so Markusson makes a significant advancement towards a more balanced conceptualisation of championing. However the characterisation of champions in Markusson’s account does not acknowledge the personality characteristics of champions which have been shown to be a significant factor in championing accounts (Howell and Higgins, 1990; Howell et al. 2005; Coakes and Smith, 2007; Mansfield et al. 2010; Taylor et al. 2011). More widely, the characteristics of individuals have been shown to be a relevant (and neglected) factor in social network research. As Totterdell et al. (2008, p.283) argue individual characteristics are important for shaping social networks:

...social network research has been principally concerned with the structure and effects of relations between people, groups or organisations.....rather than psychological attributes of the individual.....nevertheless, such attributes are likely to contribute to the formation and maintenance of ties between people within networks, and will thereby influence the behaviour of those networks.

Totterdell et al. (2008, p.283) contend that the propensity to connect with others (PCO) is dependent in part on the psychological characteristics of the individual, as they propose, “some people seem more inclined than others to make connections with people they do not know.” The importance of social capital resources to championing endeavours has been recognised (Shane, 1994; Jenssen and Jørgensen, 2004; Negoita et
al. 2012; Coakes and Smith, 2007), indeed the championing attempt is
dependent on building and maintaining organisational (and wider)
support for the initiative. Less well understand, or appreciated in
championing accounts is the influence of psychological attributes on the
ability to gain access or create access to these resources.

Totterdell et al. (2008, p.238) offer an alternative to the structurally-
determinant view of social networks, offering a conception in which, “both individual agency and social structure determine action.” Interestingly the authors find extraversion and to a lesser extent emotional
stability, to be positively associated with PCO. Burt et al. (1998) suggest
that ‘network entrepreneurs’ (those who possess structural holes in their
network) create excitement, change things and prefer to be in
authoritative positions. As such the ability of the champion to connect
with others in order to build the networks of ties needed to implement
change, could in part be contingent on aspects of innate disposition.
Efforts to understand ‘action’ (in a balanced account with structural
influences) should incorporate personality given its potentially critical
influence.

The championing literature in general tends to emphasise a relatively
narrow range of relevant personality characteristics (Renken and Heeks,
2014), including the tendency to accept risk (Beatty and Gordon, 1991;
Howell and Higgins, 1990; Shane, 1994; Markham and Aiman-Smith,
2001); Lefley (2006) display confidence (Howell and Higgins, 1990;
Jenssen and Jørgensen, 2004; Howell et al. 2005) and enthusiasm
(Howell et al. 2004; Howell et al. 2005) and show persistence and
dedication (Schön, 1963; Howell and Higgins, 1990; Howell et al. 2004;
Howell et al. 2005). By and large these assessments tend to be based on
the subjective opinion of the researcher rather than the result of validated personality measures (Howell and Higgins, 1990). As defined by Howell and Higgins (1990, p.318) these are the “qualities that predispose individuals to engage in champion activities.” Although these qualities may not only assist in understanding the inclination to champion but also champion effectiveness.

The inclusion of personality attributes in studies of championing action mask a deeper debate on the ‘origins’ of champions (as defined by Renken and Heeks, 2004). The ‘origins’ of champions centre on the ‘how’ and ‘why’ questions of championing emergence and as appreciated by Renken and Heeks, studies which address these questions are relatively rare. The authors discuss how some argue that championing is due to an innate predisposition (born); context may affect the likelihood of this predisposition being expressed but fundamentally the propensity for championing lies within individuals. The ‘made’ argument tends to assume that anyone is capable of championing with the right training and development. The proponents of the ‘appointed’ line of thinking argue that one must plan for the presence of championing, including the formal assignment of the championing role. Pinto and Patanakul (2015, p.2), for example, suggest that a Champion is actively sought for initiatives, as opposed to seeking support himself/herself:

…..it has become an article of faith that project teams should actively seek out the support of a champion; someone who can serve on behalf of the project as a representative to critical stakeholders.
3.3 Defining a Champion

Table 3.1 is adapted and updated from Roure’s (1999) considerable review of championing literature and is useful in gaining an understanding of the varying conceptualisations of champions contained within the literature.
### Table 3.1: Defining the champion

<table>
<thead>
<tr>
<th>Research Study</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Schön (1963, p.84)</td>
<td>“Essentially the champion must be a man willing to put himself on the line for an idea of doubtful success. He is willing to fail. But he is capable of using any and every means of informal sales and pressure in order to succeed.”</td>
</tr>
<tr>
<td>Rothwell et al.(1974, p. 291)</td>
<td>“Any individual who made a decisive contribution to the innovation by actively and enthusiastically promoting its progress through critical stages.”</td>
</tr>
<tr>
<td>Maidique (1980, p. 64)</td>
<td>“A member of an organization who creates, defines or adopts an idea for a new technological innovation and who is willing to risk his or her position and prestige to make possible the innovation’s successful implementation.”</td>
</tr>
<tr>
<td>Higgins &amp; Howell (1990a, p. 40)</td>
<td>“Champions make a decisive contribution to the innovation process by actively and enthusiastically promoting the innovation, building support, overcoming resistance and ensuring that the innovation is implemented.”</td>
</tr>
<tr>
<td>Markham et al. (1991, p. 219)</td>
<td>“A role where individuals are strong advocates for a project and generate positive behavioural support for an innovation during its development or work on behalf of the project in the face of organizational neutrality or opposition.”</td>
</tr>
<tr>
<td>Beath (1991, p. 355)</td>
<td>“Information technology champions are managers who actively and vigorously promote their personal vision for using information technology, pushing the project.”</td>
</tr>
<tr>
<td>Source</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------------------</td>
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</tr>
<tr>
<td>Day (1994, p.149)</td>
<td>“The agent who helps the venture navigate the socio-political environment inside the corporation.”</td>
</tr>
<tr>
<td>Shane (1994, p. 29)</td>
<td>“An advocate whose goal is to promote the innovation.”</td>
</tr>
<tr>
<td>Shane et al. (1995, p.935)</td>
<td>“…the prevailing system of authority and routines creates conditions that go against some of the requirements of innovation activity. In order to overcome these obstacles, a champion emerges to do what is necessary to get the job done whether or not these ways are consistent with organisational norms and routines.”</td>
</tr>
<tr>
<td>Markham &amp; Griffin (1998, p.437)</td>
<td>“A person who takes an inordinate interest in seeing that a particular process or product is fully developed and marketed.”</td>
</tr>
<tr>
<td>Roure (1999, p.4)</td>
<td>“Any individual who made a decisive contribution to the innovation by actively and enthusiastically promoting its progress through critical stages in order to obtain resources and/or active support from top management.”</td>
</tr>
<tr>
<td>Andersson and Bateman (2000, p.549)</td>
<td>“Individuals who, through formal organisational roles and/or personal activism, attempt to introduce or create change in a product, process, or method within an organisation.”</td>
</tr>
<tr>
<td>Markham and Aiman-Smith (2001, p.45)</td>
<td>“The champion’s critical contribution is generating needed project support from other people throughout the organisation. This prime characteristic helps”</td>
</tr>
<tr>
<td>Source</td>
<td>Quote</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Jenssen and Jørgensen (2004, p.65)</td>
<td>“A champion is an individual that is willing to take risks by enthusiastically promoting the development and/or implementation of an innovation inside a corporation through a resource acquisition process without regard to the resources currently controlled.”</td>
</tr>
<tr>
<td>Howell and Boies (2004)</td>
<td>“In addition to idea promotion and implementation, champions may also be involved in the first stage of the innovation process, idea generation.”</td>
</tr>
<tr>
<td>Boiral et al. (2008, p.481)</td>
<td>“Environmental initiatives are...dependent on champions of environmental causes within organisations who are capable of introducing a new vision, initiating change, and mobilising resources for their cause.”</td>
</tr>
<tr>
<td>Markusson (2010, p.777)</td>
<td>“Any effort made by an actor (individual or collective) in a firm to promote environmental issues.”</td>
</tr>
<tr>
<td>Gattiker et al. (2010, p.74)</td>
<td>“The project champion can be conceptualised as the agent, who tried to influence someone else (the target) regarding an environmental project.”</td>
</tr>
<tr>
<td>Taylor et al. (2011, p.412)</td>
<td>“...they are emergent leaders who are centrally involved with effecting transformations within organizations or broader institutions.”</td>
</tr>
<tr>
<td>Pinto and Patanakul (2015, p.1180)</td>
<td>“Project Champions ....seek to influence other people in their organization regarding an issue or project.”</td>
</tr>
</tbody>
</table>
The tensions between action and structure are reflected in the varying definitions detailed and lead to a number of debates in the literature. Markham et al. (1991) highlights the tension between the individual and the organisation-implying that the individual may have to fight against the organisation in order to implement change. Andersson and Bateman’s (2000, p.549) definition of championing “....through formal organisational roles and/or personal activism” suggests that a champion may promote an environmental innovation through a formal route using his position, or informally, through lobbying and persuasion. However, Howell and Boies (2004) denote that champions emerge informally to promote innovations (Schön, 1963; Tushman and Nadler, 1986), and as such are viewed as going ‘above and beyond’ the prescription of their official duties. Although the conceptualisations of championing may vary, which is dependent in part on the researcher’s position on the primacy of the individual over context, they share some common features. These include the promotion of an initiative, generating interest and building support through the utilisation of organisational resources. Interestingly, Schön’s seminal definition assumed the innovator to be male, which in terms of radical military innovations during the time is not unusual. However since that characterisation, definitions have replaced ‘man’ with ‘individual.’ Although it is hard to establish the extent to which the studies of champions have included both male and female participants, since the delineation of either is rarely described. There is debate on the influence of gender difference on ‘innovativeness,’ Damanpour and Schneider, (2009) for example found no link between gender and innovation adoption, whilst Sexton and Bowman-Upton (1990) found risk propensity to be gender specific. Efforts should be directed at addressing issues of gender in championing accounts, as supported by Renken and Heeks (2014). Attempts to define
and classify the championing role more widely have led to the drawing of parallels with other types of organisational roles.

### 3.3.1 An Entrepreneurial Spirit?

Howell and Higgins (1990) proposed that champions and entrepreneurs share a number of important and distinguishing characteristics. In order to test this assertion the authors utilised 5 scales, Risk-taking, Innovation, Social Adroitness, Achievement and Endurance from Jackson’s personality inventory (1976) and the Personality Research Form Jackson, (1967) respectively. Their study focused on IT champions who had also championed other initiatives. It was found that champions were extremely self-confident, possessed high energy, were persistent (to the point of being relentless) and showed a willingness to incur personal risk (professional reputation/prestige). In terms of the entrepreneurial factors, risk-taking was the only significant variable with achievement and innovativeness approaching significance. The authors consequently argue that due to these individual differences some may be predisposed to emerge informally and champion innovation. Baron (1998) in Howell and Boies (2004, p.139) suggests it is possible that, like entrepreneurs, champions ‘think’ differently.

Discussing the features of an entrepreneurial character more generally, Howell and Higgins (1990) cite Maidique (1980) and Burgelman, (1983) who note that entrepreneurs generally score highly on the need for achievement, that they have a desire to take responsibility for decisions, prefer decisions involving a moderate degree of risk, dislike routine work
and are interested in concrete knowledge of the results of decisions. By contrast Timmons and Spinelli, (2009) and Van Aardt et al. (2008) highlight the agreeable nature of entrepreneurs (nurturing, the ability to get along with others) as well as conscientiousness, openness and extraversion. Markham and Aimna-Smith (2001) state that risk-taking in common with entrepreneurial characteristics, tops both anecdotal and empirical studies of champion personality traits, although Markham et al. (1991) suggest that champions are just as likely to work on projects that do not carry a high risk. Markham and Aiman-Smith (1991, p.48) do however go on to posit, “It is not that they [champions] fail to see risks and problems; if anything, they see risk more clearly than others and are willing to accept the risk.” Lefley (2006) suggests that champions, due to their over enthusiasm, may deem project risks lower and project benefits higher than they really are.

However caution should be drawn against discussing notions of ‘risk’ in general terms. Nicholson et al. (2005) argue that risk is domain specific; for example someone who takes risks at work may not take risks in their personal life. Risk taking, in any domain, it is argued, is influenced by a combination of factors; personality being one, but also sex, age as well as domain specific variables. The level of conscientiousness possessed by individuals was found to have a significant influence on risk behaviour. For example, people who score highly in conscientiousness will pursue material or personal reward through disciplined striving rather than risk taking (Nicholson et al. 2005). This is supported by McCrae and Costa (1992) who state that conscientious people tend to seek happiness through detailed plans and responsibility at work (and in life). On the other hand, people with low conscientiousness will adopt an approach that takes chances, rather than through a course of action requiring
controlled effort. Sexton and Bowman-Upton (1990) also suggest that risk propensity is gender specific.

Although Jenssen and Jørgensen (2004) citing Green et al. (1999), warn against drawing too strong a parallel between the champion and the entrepreneur, or at least independent entrepreneurs, suggesting the existence of important contextual differences, namely the resources available and the resource acquisition process. Although, as Walley and Taylor (2002) appreciate, there is great diversity in what actually constitutes an ‘entrepreneur’, with no agreed definition. Indeed, Walley and Taylor (2002) point to the multi-concept of entrepreneur; entrepreneurial behaviour is being studied in large organisations (not just small business owner-manager scenarios) as well as in social, civic and artistic contexts (Leadbeater, 1997; Thompson, 1998 in Walley and Taylor, 2002). Though, acknowledging the lack of academic attention to ‘green entrepreneurs’ in the UK, Walley and Taylor (2002) suggest that environmentalism and entrepreneurship share commonalities in terms of social process and attitudes, and the moral dimension of environmentalism can act to empower entrepreneurship. However, Crane (2000, p.681) suggests that, “to avoid personal marginalisation or stigmatization, championing had to be disassociated from any overtly moral agenda.” Indeed, Andersson and Bateman (2010) found that the use of drama and emotion in influencing techniques was associated with an increased likelihood of championing success only in instances when the environmental paradigm of an organisation was strong, supporting previous research by Purser et al. (1995) and Shrivastava, (1995).
3.3.2 Intrapreneurs

Parallels have been drawn between champions, entrepreneurs and ‘intrapreneurs.’ Burgelman, (1983) defined intrapreneurship as the act of developing a new venture within an organisation, exploiting a new opportunity and creating economic value (Pinchot, 1985). Mezel et al. (2007) states that intrapreneurs develop new ideas and exploit opportunities to make them profitable, strive for change and develop creative new directions for the organisation. There is an emphasis in intrapreneurial conceptualisations of profit orientation or ‘economic value,’ whilst a champion may not necessarily act to create profit, he/she may need to present a strong business case for the innovation. The authors state that intrapreneurs can be the foundation of technological innovation, suggesting that engineers in particular play important entrepreneurial roles in their organisations. Engineers must embrace revolutionary change, be capable of working in a multi-disciplinary manner and possess vision (Mezel et al. 2007).

Ulijn et al. (2007) state that the ‘ideal’ intrapreneur should possess vision and creativity, show initiative, take risks, display persistence and possess knowledge of the organizational structures. It can be seen that there are certain shared characteristics of the champion and the intrapreneur. However, there are potentially important differences. For example, Galbraith, (1982) states that intrapreneurship requires organisational units such as Research and Development (R&D) units which are completely dedicated to the creation of new ideas for future businesses. Indeed Vesper (1999) created an entrepreneurial typology which differentiates amongst other roles, an Innovator, a Champion and an Intrapreneur. A Champion according to Vesper, is someone who supports the ‘Innovator’
who develops something other than a company (i.e. a new business entity). An intrapreneur however takes responsibility for the creation of a new business unit within an existing organisation. Thus it would seem that central to the notion of the intrapreneur is the establishment of a new company, (a new business unit), whilst one could argue that the DH champion essentially develops or helps to develop an organisational model, which in many cases may be an arms- length LA Energy Services Company (ESCo). There is more of an emphasis in the intrapreneurial literature on the creation of a business unit as the primary focus of the intrapreneur, whereas for the Champion (of DH at least) this is essentially a by-product of his championing the technological innovation.

3.3.3 Transformational Leaders

Howell and Higgins (1990) contend that behaviour, leadership and influence are important dimensions of championing as champions essentially act as informal leaders and innovation adoption is, to a significant degree, a process of influence (Burgelman, 1983; Dean, 1987 in Howell and Higgins, 1990). Howell and Higgins (1990, p.320) propose that champions are transformational or charismatic leaders. Citing Burns (1978) they state, “These champion behaviours are similar to the qualities of transformational leaders, leaders who inspire their followers to transcend their own self-interests for a higher collective purpose.” Although such conceptualisations should be treated carefully as they run the risk of neglecting the role of self-interest (Markusson, 2010).

House and Howell (1992) find that charismatic leaders in modern complex organisations are supportive, nurturing and sensitive, tendencies that
necessitate a more altruistic or agreeable nature (Bass, 1985). Wiggins (1996) found that the chief motivation for individuals who score highly in Agreeableness is altruism (the concern for others) (McCrae and John, 1998). This is contrary to Farrington’s (2012) assertion that being ‘nice’ was not a necessity for small business leaders. Indeed Lyubomirsky et al. (2005) found that agreeable people tend to get on well with their peers, which it could be suggested is of importance for coalition-building champions. Indeed Mansfield et al. (2010) found that innovators possessed higher levels of altruism compared to non-innovators especially at lower-mid level management; senior-level champions also displayed greater levels of altruism, at a smaller correlation.

3.4 Understanding Champion Motivation: Why?

The tension between action and structure in the literature is clearly discernible in the attempts to consider championing motivation. Markusson (2010, p.778) calls into question the lack of acknowledgement of self-interest in action-centred approaches: “heroic accounts of champions tend to be uncritical of the champion’s goals….and describe them as benefiting the whole organisation.” As Russell (1986, p.60) surmises:

Action approaches are essentially individualist, seeing social formations and outcomes as produced by individual human agents….they are mostly voluntarist, seeing those agents as endowed with autonomy, free will and reason, thus leaving motivation as an unexplained independent variable.

At the same time, Markusson (2010, p.779) warns against the adoption of
a purely structural perspective which would make the champion a simple product of organisational structures, ‘Structurally determined dupes.’ Those studies which adopt the position that championing is the function of innate qualities tend to focus on the characteristics that drive or incline the individual to champion. Mansfield et al. (2010) propose that champions are motivated to champion due to an intrinsic need for excitement. The authors find that champions are driven by an intrinsic motivation; the excitement/interest in the innovation; the ‘champion lives for the innovation’ (Mansfield et al. 2010, p.42). It is suggested therefore that the champion pursues the innovation for the thrill of innovating without any ‘external demand or reward contingency’ (Mansfield et al. 2010, p.1132).

Likewise, Taylor et al. (2011, p.420) discuss the ‘intrinsic motivation’ to champion. Chrusciel (2008) finds that intrinsic values such as pride in accomplishment or eagerness to learn are important motivators for championing behaviour. Moon and de Leon (2001) and Rivera, et al. (2000) write of the influence of the values of organisational leaders on innovation adoption. Markusson (2010) advises against uncritical accounts of the champion’s motivation which fail to consider any element of self-interest. Indeed, Pinto and Patanakul (2015) go as far as to suggest that narcissistic tendencies may play a role in the propensity of some to champion. Markham and Aiman-Smith (2001), however suggest that champions may support projects in order to benefit their department.

Howell and Higgins (1990) make an attempt to acknowledge both action and structure in consideration of motivation, suggesting that the decision to engage in influence is a function of a host of elements; self-characteristics (risk propensity, need for achievement, persuasiveness),
characteristics of the influence target (perceived relative power) and situational factors (reasons for exercising influence) (Howell and Higgins, 1990, p.323). It is further suggested that the need for power and the need for achievement is positively related to the tendency to engage in influence and also the types of influence techniques employed in organisational decision-making. Markusson (2010, p.781) revealed a range of motivations for his participants which impacted upon the career paths which led to championing; private life concerns, general environmental concern and for some it was simply ‘another job that came along.’ However, Markusson moved the focus away from intrinsic qualities to show how the organisation provided structured opportunities for championing irrespective of underlying motivation. As Markusson (2010) explains, “The structured organisational context thus shaped the career paths of the potential champions, as well as the opportunities for championing presented to them.”

These factors are useful in shedding light on important aspects of motivation, however unless accounts of motivation consider both action-related and context-dependent factors they provide only a partial explanation. The motivation to champion is a complex matter, the literature points to a host of factors including intrinsic drivers, private life concern and the desire to benefit the organisation (or department). The tendency in the literature to examine motivations based on innate inclinations neglect the influence of structurally-determined factors which shape the ‘opportunity for championing’ (as argued by Markusson, 2010). This is vital as consideration of more structural features, including organisational agendas and wider drivers enables a more objective appreciation of the extent of individual initiative in championing attempts. Moreover, championing attempts by their very
nature are context-specific, they are the result of the reaction of certain individuals (who may be inclined to either seek or react to) opportunities for change/improvement in their environment. As Markusson (2010, p.782) states, “effective championing emerged as a confluence of championing action and structured championing opportunities.” As such ‘motivation’ should encompass both action-related as well as context-dependent components in order to provide a balanced assessment of the reasons driving the instigation of change.

3.5 Organisational Context

The majority of the literature on championing accounts tend to focus on the qualities and behaviour of the individual champion, these action-led accounts fail to fully appreciate the role of context and contingency. In addition, very few championing accounts specifically address the peculiarities of the public sector organisational context that necessitate specific attention (Hartley et al. 2007; Meijerink and Huitema, 2010; Taylor et al. 2011, 2012; Damanpour and Schneider, 2009; Winistorfer, 1996). As Damanpour and Schneider (2009) state:

In light of differences in ownership, source of funding and relative reliance on political control versus market forces between the two sectors (Perry and Rainey, 1988), more academic research on both the antecedents and consequences of innovation in the public sector is needed.
Renken and Heeks (2014) also call for a greater level of research into the role of the individual champion in the organisational context, in particular how organisational factors such as structure, culture and compensation may affect championing action and innovation performance. Howell and Higgins (1990a), whilst adopting a strongly action-centric approach, do consider aspects of context, discussing important aspects of organisational culture; namely the availability of support for innovation. For example, an organisational environment which is strongly resistant to change may require a champion who is willing to violate organisational rules and norms in a ‘renegade’ approach. By contrast, the rational traditional process (the most common approach) involves the presentation of a case that in some way is perceived as essential for the organisation (for example, in staying ahead of competition). The rational process is affected by the culture of the organisation; a culture which is supportive of risk-taking and the voicing of new ideas is less challenging for the champion in gaining top-management support. Mullins et al. (2008) also emphasises the importance of a culture or ‘climate’ that is supportive of innovation. Furthermore, the champions in the study were asked how an organisation’s management through organisational change may help to encourage champion emergence. The 5 following initiatives were expressed to be potentially beneficial:

- Job autonomy and diverse career experience
- Commitment to vision-supporting innovation
- Visible recognition for creative ideas
- Top management sponsorship (especially important during early phase of technology adoption)
- Running interference (top management blocking of obstacles)
Resistance to change

Gattiker and Carter (2010) state that environmental initiatives often require changes to business practices and reward systems as such one can encounter resistance by personnel in various functional areas. Likewise, Van de Ven, (1986) in Shane et al. (1995), argues innovation can create uncertainty and upheaval that generates resistance from organisational members (Schön, 1963; Burgelman, 1983; Van de Ven, 1986; Howell and Higgins, 1991; Frost and Egri, 1991). It is argued that this resistance creates a need for a champion. Existing systems of authority and routines can create conditions that go against some of the requirements of innovative action. Shane et al. (1995) found a link between the levels of power distance in a society and a greater likelihood of the champion focusing on gaining support from those in authority before taking action, as opposed to building a coalition of support amongst colleagues first. Shane et al. (1995, p.934) further propose three specific organisational features that can make implementing innovative change difficult:

1. *The existence of specialisation which causes organisational members to concentrate their attention on their own responsibilities and to ignore the activities of other organisation members;*
2. *Existing systems of power and resources which may be threatened by change;*
3. *Organisational inertia.*

Winistorfer et al. (1996, p.55) suggest that public sector organisations
may be particularly reticent to innovate due to the heavy bureaucracy and culture of risk avoidance. In addition the authors argue that the public service mandate mean that public bodies serve a diverse ‘customer’ group, often with competing demands, “Changes made favouring one customer’s interests, are or at least perceived to be, to the detriment of other customer.” Likewise, Damanpour and Schneider (2009) cite particular public sector constraints to innovation including lack of incentives, insufficient funding, the need for public support and political pressures. Summerton (1992) found that strong, local political support was incremental to the efforts of the system builders in her insightful study. These barriers and organisational peculiarities highlight the importance of acknowledging the organisational context, as well indicating the empirical importance of studies which focus specifically on public sector champions given their organisational constraints.

3.6 Championing Behaviour: How?

The literature emphasis a range of tactics and strategies that are employed by champions in order to instigate and implement change. These champion strategies can be delineated according to those which employ a rational (formal) approach and those which adopt more informal strategies, for example ‘bootlegging’ (Augsdorfer, 1994 as cited in Jenssen and Jørgensen, 2004).

Andersson and Bateman (2000) emphasise the power of individual initiative in creating action on environmental issues in their study on the process by which champion’s champion. Gattiker and Carter (2010) state
that the ability to gain the commitment of others is pivotal to successfully implementing environmental management projects. The authors further suggest that senior management support is associated with a champion’s ability to gain other’s commitment, although other environmental management studies have had mixed results. In their study it was found that the four tactics which are the most effective for gaining other’s commitment for an environmental project are inspirational appeals, consultation, rational persuasion and ingratiation. The positive result for consultation suggests that gaining advocates’ input on project goals and implementation is important for developing a sense of ownership towards the initiative (Gattiker and Carter, 2010). Ingratiation has a negative effect on commitment, suggesting that champions should avoid ingratiation when dealing with their colleagues. Rational persuasion, it is argued, is an important but not sufficient tactic in the environmental management arena, further suggesting that it should be combined with other influence tactics to be most effective. ‘Legitimiating’ (associating a new initiative with the rules and policies of the organisation) was not found to be strongly associated with commitment, in spite of its highlighted relevance to environmental initiatives (which are strongly driven by regulation) (Gattiker and Carter, 2010).

In contrast to other studies which emphasise the importance of building a support network for innovation, Gattiker and Carter (2010) found an insignificant role for coalition, suggesting that whilst it is one of the most cited hard tactics in previous studies, the results on its effectiveness are mixed. Indeed, it is argued that many individuals lack an understanding of which tactics to emphasize when seeking to gain other’s buy-in to environmental initiatives (Gattiker and Carter, 2010).
The ability of the champion to gain the support of others is considered by some as dependent on a collective effort. Indeed, Hauschildt and Kirchmann (2001) reinforce the idea that groups of individuals may champion innovations, appreciating that complex innovations may require a multitude of ‘promotors’. Markusson (2010), with his terminology, ‘individual or collective’ suggests the possibility of a group effort or group championship. Likewise Markham et al. (1991) find that 65% of projects had two or more champions. Day (1994) found that multiple champions arise from different parts of the organisation to ensure the project moves through the necessary stages of development. Likewise Winistorfer (1996) suggests that innovation (in Government agencies) may be dependent on a number of different champions with complementary skills at different levels of the organisation. There is relatively limited research into team championing as appreciated by Jenssen and Jørgensen (2004). However, aspects of collectivism and creativity have been explored in the organisational behaviour literature; for example Goncal and Staw (2006), as well as multiple champions and innovation networks (Klerkx and Aarts, 2013).

Markusson (2010, p.778) also emphasises the importance of maintaining perspective on the champion for example, through an appreciation of the many roles played by actors during the process of organisational change. This helps one to avoid essentialist or static representations. Likewise Summerton’s (1992) thesis shows that the champion of her DH system was the not the champion from the beginning, indeed he was the system’s most ardent critic, his perspective changed when he undertook a gatekeeping role between the private consultants initiating the DH feasibility study and the municipality.
Indeed, one can draw a parallel with Hughes’s conceptualisation of the differing roles embodied by a ‘System Builder’ based on invention, management or finance, which were dependent on, “one level of the process of technological change” (Hughes, 1979, p.124). Hughes (1983, p.20) defined system builders as, “….. innovators, similar to Schumpeterian entrepreneurs, who build a bridge between resources and demand.” The notion of the system builder and its relevancy to the study of DH champions is further examined in Chapter 4.

The commonality which defines and links them as system builders according to Hughes, is that “Edison, Insull and Mitchell were strong holistic conceptualisers and determined solvers of the problems frustrating the growth of systems” (Hughes, 1979, p.125). The System Builder role is inextricably linked with the system; as the system grows and evolves and new challenges to continued growth emerge, so to do the requirements of the system builder. Underpinning the various system goals is system growth. People were integrated into the system in the same way that technical components were. It can be said that the process of system building was an all-consuming one, “...the working day sometimes extended nearly twenty-four hours...” (Hughes, 1979, p.130).

Discussing the organisational position of the champion, Esteves and Pastor (2002) argue in their study on IT champions that a champion’s importance is due to their position of seniority in an organisation, which they suggest allows them to leverage and mobilise the necessary resources. However Markham and Aiman-Smith (2001) discussing Day’s (1994) study of 136 champions across a range of industries found that champions can arise from all levels of an organisation and from various functional areas (Markham et al. 1991 in Markham and Aiman-
Smith, 2001).

Tenure

The length of time spent in a role (tenure) has been highlighted as an important factor in the ability to gain organisational support. The 25 champions in Howell and Higgins’ (1990a) study were in middle-management positions with an average of 18 years working experience with their respective companies. This lengthy employment it is argued, enables three important conditions for champions; champions are perceived with credibility, with high competence and the ability to manage ‘risky’ projects. It is suggested that champions with lengthy tenures have learned through their involvement in other ‘risky’ projects in their early career, this self-confidence engenders a willingness to take on risky projects (Howell and Higgins, 1990a). In addition, they possess through their long experience in the organisation, an in-depth knowledge of the industry and what constitutes a suitable idea for their business. As the champions may have worked in multiple divisions across different geographic locations, they have established a network of contacts and are able to perceive a multitude of business perspectives. However, Gattiker and Carter (2010) propose that environmental initiatives are instigated by grass roots or middle level management who lack positional power (Drumwright, 1994; Friend, 2007); although the authors argue that skilful use of influence can compensate for this lack of positional power (Gattiker and Carter, 2010).

Although lengthy employment is associated with trust and respect in the public sector context (Damanpour and Schneider, 2009), Winistorfer (1996, p.56) suggests that the lack of varied experience that remaining
with the same organisation involves (as is the tendency in the public sector) can engender ‘narrow solution sets,’ which lack creativity. Damanpour and Schneider (2009) conclude that tenure in the public sector had a positive effect on innovation adoption up until the point where it reduces the manager’s willingness to change accustomed practices. Likewise Kamal (2010) and Gupta et al. (2006) suggest that the champion’s career experience is varied and extensive. As well as considering career paths, Markusson (2010) also highlighted the relevance of the skills and knowledge base of champions. Damanpour and Schneider (2009) also discuss the importance of education and innovation. The authors state that education inspires receptivity to new ideas and positively influences the identification of the need for innovation (Damanpour and Schneider, 2006 as cited in Damanpour and Schneider, 2009). As proposed, “Educated managers may also have greater cognitive ability to handle the information processing associated with complex innovation and change” (Young et al. 2001 in Damanpour and Schneider, 2009, p.503). Although the connection between a strong education and innovative capacity are acknowledged in the literature, very little is detailed about what actually constitutes a ‘good’ standard of education, with limited empirical evidence of the educational attainment of champions.

3.7 Environmental Influencers

Factors in the wider environment external to the organisation have also been found to be relevant to the championing attempt, although there has been relatively limited research on deeper structural influences. Taylor et
al. (2012, p.86) do however point to the external factors that can influence the leadership of water champions, citing rapid and substantial change, such as population growth, and the existence of crises which generate political and community concern such as severe drought.

Markusson (2010) also widens the sphere of the champion by discussing the influence of regulatory pressures in his study of the chemical and dairy industries in Sweden and Scotland. It is argued that regulatory pressure over time shapes management career paths for engineers willing to bundle environmental skills with technological and managerial skills, creating a mechanism that can contribute to bridging the gap between technological and environmental work in firms. However, Gattiker and Carter (2010) contend that Government regulation is negatively associated with target commitment; the more a project is motivated by current regulation or the threat of future regulation the less likely individuals are to commit to the project. Regulation may be a way to force organisations to implement various measures, but regulation alone is not sufficient when it comes to gaining buy-in at the level of an individual actor within an organisation. In fact, it may be counter-productive (Gattiker and Carter, 2010). However, in Andersson and Bateman (2010) 8 of the 22 champions interviewed used regulatory or competitive pressures as a way to frame the initiative as urgent. Caerteling et al. (2013) also discuss Government intervention and its effect on technological development, noting that Government championing may have a greater impact than technical or financial assistance on project performance, as well as having a beneficial effect on the prospective customers of the new technology. Having considered the literature on championing in general, in the next section attention is focused on the DH Champion specifically.
3.8 The District Heating Champion

The following section introduces the idea of a DH Champion, examining the literature which addresses the concept and considers the relevancy of the ‘system builder’ notion introduced in the previous section. Rytoft and Strömberg (2009) (in summary) suggest in their study that a DH Project Champion:

- Seizes a local opportunity (the ‘catalyst’)
- Learns from the DH experiences of others
- Appoints those with the relevant knowledge to plug any perceived skills gaps
- Uses the means at their disposal to encourage support of DH i.e. the Planning Process
- Alleviates customer concerns
- Operate for the benefit of the local population and economy (in the case of Aberdeen and Lerwick DH)
- Shows determination and competence

Strikingly, the principles of learning from the DH experiences of others (Rytoft and Stromberg, 2009; Bolton, 2010) is similar with to the study trips detailed in Hughes (1979). Likewise, both indicate the importance of appointing those with the relevant skill-set and the personal qualities of determination and commitment. As such, the relevancy of the notion of the System Builder appears to be salient with the modern Champion of DH, the context of strong public ownership (in the strict state owned sense) may have altered, but the role of the public sector in energy matters
is still significant. The commonalities between both concepts will be examined in further detail in Chapter 4.

As indicated by Rytoft and Strömberg (2009), Hawkey (2009) and Bolton (2010), the notion of the central actor is still highly relevant to the development of modern technological systems. Summerton (1992), in her influential study, noted that Mjölby’s DH system surprisingly lacked a ‘champion’ from the beginning; instead its managers became the ‘champions’ of the system. Unusually, the person who became one of the DH system champions was actually the person most strongly opposed to its initiation, being at the time the head of the competing organisation. His position changed when he became a ‘gatekeeper’, liaising between the municipality and the expert consultants who were undertaking a feasibility study for DH. The DH champions had the “… specific attributes of, hard-working, enthusiastic and ‘hands on,’ proactive in seeking new knowledge and adopted an approach that went above and beyond the expected.”

Likewise, Hawkey (2009, p.48) suggests that the successful introduction of DH in specific areas can often be credited to ‘the enthusiasm of particular individuals within LA’s.’ Indeed, Rytoft and Strömberg (2009) write of the importance of a champion as a major driving force for DH schemes in the UK, for both public systems and private systems. This is mirrored by Chittum (2012) in Chittum and Østergaard (2014) who emphasised the importance of a local champion for the development of DH systems in the US. This is reinforced by Sommer et al. (2003) who implicated the lack of a champion or central agency in the failure of DE systems in the US. Likewise a participant in Bale et al.’s (2012, p.245) study on LA energy planning in the UK suggested the need for a
champion to ‘push through the red tape.’

Bolton (2010) also highlighted the role of ‘entrepreneurial’ individuals within LA’s who have been instrumental in shaping the approach adopted to low carbon infrastructure. A participant within Bolton’s study suggests that the lack of a DH policy framework creates a greater level of autonomy at the local level which enables these ‘gifted people’ to emerge. Likewise Hawkey (2009) supports this assertion surmising that this may be due to a lack of systematic consideration of DH across LA.

As Bolton (2010, p.210) further states, “these individuals are important because organisations such as Local Authorities are known for their reluctance to take risks,” suggesting that the bureaucratic nature of LA’s means change is hard to initiate. This is supported by Winistorfer (1996) and Damanpour and Schneider, (2009). Bolton (2010) goes on to define two types of champion; a Technical Champion and a Political Champion. The Political Champion operates to elevate the DH agenda at a senior level in order to gain high-level support, whilst the Technical Champion oversees the fundamental aspects of system development. An additional participant in Bolton’s study suggests that both a Technical and a Political Champion are required in order to penetrate the many layers of decision making within a LA (Bolton, 2010). The two roles defined by Bolton (2010) can be paralleled with the Project champion and the Executive champion as defined by Howell and Higgins (1990) and Taylor et al. (2011). The participant in Bolton’s study suggests that a ‘grassroots level’ champion is needed as well as a senior-level champion, who critically are both public sector. Bolton (2010, p.208) further defines the key roles that Councils play in the various UK DH schemes:

- An Enabler: A Council acts in an enabling capacity when it actively
generates a market for heat and funds the expansion of a particular scheme;

- A Promoter: The LA’s reputation and trustworthiness is harnessed to attract customers;
- A Customer: Typically a LA will itself become an anchor load of a burgeoning DH system;
- An Investor: LA’s may exploit their ability to access finance at low rates.

Hawkey (2009, p.24) also appreciates the variety of roles a LA can play and recognises local Government as a ‘significant actor.’ Despite the references to DH Champions, very little is known about the types of individuals who emerge within a Local Authority context to champion DH and how the ‘opportunity for championing district heating’ develops. Table 3.3 provides a summarisation of DH champion definitions and references. In addition, system builder conceptualisations have been included to highlight the relevancy to the championing concept.
### Table 3.3: The DH champion

<table>
<thead>
<tr>
<th>Research Study</th>
<th>Insight</th>
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<tbody>
<tr>
<td>Hughes, (1979, p.125)</td>
<td>“System builders [Edison, Insull and Mitchell] were strong holistic conceptuálisers and determined solvers of the problems frustrating the growth of systems.”</td>
</tr>
<tr>
<td>Hughes, (1983, p.20)</td>
<td>“System builders are innovators, similar to Schumpeterian entrepreneurs, who build a bridge between resources and demand.”</td>
</tr>
<tr>
<td>Summerton (1992, p.146)</td>
<td>“…specific attributes of, hard-working, enthusiastic and ‘hands on,’ proactive in seeking new knowledge and adopted an approach that went above and beyond the expected.”</td>
</tr>
<tr>
<td>Russell, (1994, p. 590)</td>
<td>“Committed champions were crucial to success.”</td>
</tr>
<tr>
<td>Disco and Van der Vleuten (2002)</td>
<td>“System building draws attention to the process in which certain historical actors (the ’system builders’) manipulate and juxtapose heterogeneous (technical as well as non-technical) elements into one sociotechnical whole.”</td>
</tr>
<tr>
<td>Van der Vleuten and Kaijsr (2004)</td>
<td>“…System builders, the actors that design, build and control systems.”</td>
</tr>
<tr>
<td></td>
<td>“There is no principal objection to studying organisations (companies, Governments) as system builders……..some have even argued that the system builder concept can be stretched to include cooperation’s between several organisations, or groups of actors.”</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Characteristics of a DH Champion:</td>
</tr>
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<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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</table>
| Rytoft and Strömberg (2009) | - Seizes a local opportunity (the ‘catalyst’)  
- Learns from the DH development experiences of others  
- Appoints those with the relevant knowledge to plug any perceived skills gaps  
- Uses the means at their disposal to encourage support of DH i.e the Planning Process  
- Alleviate customer concerns  
- Operate for the benefit of the local population and economy (in the case of Aberdeen and Lerwick DH) |
| Hawkey (2009, p.48) | "The successful introduction of DH in specific areas can often be credited to the enthusiasm of particular individuals within LA’s." |
| Bolton (2010, P.211) | "These individuals are important because organisations such as Local Authorities are known for their reluctance to take risks." |

Two roles defined: Political Champion operates to elevate the DH agenda at a senior level in order to gain high-level support, whilst the Technical Champion oversees the crucial aspects of system development.
The literature offers insights into the DH champion, recognising the importance of the role for DH development and also appreciates that the champion generally works ‘above and beyond’ the call of duty. There is also a nod to the importance of personality and qualities (Summerton, 1992 and Rytoft and Strömberg, 2009). However, no rigorous personality testing has been performed, rather these are the subjective opinions of the researchers in question. Furthermore, very little is known about the backgrounds of the Champions including career history and education and also their values and private life concerns and how these might have influenced both their propensity to champion and their relative effectiveness in the role. Likewise, organisational and contextual issues are relatively neglected. Given the recognition of the importance of the champion to technological innovation as well as a commitment by the UK Government to increasing the uptake of DH systems, a greater understanding of these key individuals may be critical to realising DH’s full potential in the UK.

The role of the public sector, namely Local Authorities in driving the DH agenda is acknowledged both in countries with mature DH systems and more virgin DH markets such as the UK (Rytoft and Strömberg, 2009). The issue of whether an individual can be formally appointed to the role of champion is also a debated matter. Campbell (2000) suggests that encouraging employees to take initiative beyond their job requirements can result in unwanted consequences. It is suggested that organisational goals and boundaries need to be communicated. George and Zhou (2002) (in Howell and Boies, 2004) further suggest that organisations can help to foster creativity and innovation through global rewards such as pay rises and promotions rather than narrow rewards associated with a specific creative task. Involving employees in general discussion about
the organisations, its mission and goals may also promote an understanding of the organisational context and engender a greater effectiveness at championing potential innovations throughout the organisation (Dutton et al. 2001 in Howell and Boies, 2004). Indeed, Howell and Boies (2004) discuss the notion of formal appointment of a champion, suggesting that involvement in idea generation may be better suited to formal leaders; idea promotion perhaps would benefit from remaining informal. Yukl (2002) argue that those who willingly put themselves forward (without formal appointment) to sell an idea may be more credible than someone who has been officially tasked with promoting the initiative. Howell et al. (2005, p.643) suggest that, “championship may be a constellation of behaviors that can be nurtured and learned.”

The literature on championing (whether adopting an agency or structural approach) tends to neglect the role of the innovation itself. As Damanpour and Schneider (2009) state, “With few exceptions research which includes innovation characteristics as predictors of innovation adoption is scare.” As a large technical system (LTS), district heating is at once socially shaping and socially shaped. A failure to acknowledge the characteristics of the innovation would disregard the reciprocal nature of technological development. As a complex, large-scale infrastructure DH may impose certain challenges on its system builders which are worthy of further investigation.

Howell and Higgins (1990, p.325) recognise the importance of specifically identifying the type of innovation that is being championed. This clear identification of the type of innovation is necessary “in order to overcome the empirical instability and theoretical confusion arising
from research on innovation in complex organisations” (Howell and Higgins, 1990, p.325). There is, however, a more important argument for the need to specify the types of innovation. It is the contention of this thesis that the nature of the innovation itself could have a significant impact on the types of strategies required to implement and institutionalise the innovation. Indeed, Renken and Heeks (2014) call for a greater level of contextual appreciation in championing studies and how varying technology types, organisational types & environments may affect championing action, relationships and processes etc.

3.9 Chapter Conclusions

Table 3.4 (Appendix D) summarises some of the main themes examined which are underpinned by the tension between action and structure which runs through the championing literature. Indeed, as proposed by Markusson (2010), a greater balance between action and structure should be sought so as to avoid the pitfalls associated with essentialism and voluntarism on the one hand and extreme structural perspectives on the other. However, efforts to do so should not, and need not marginalise the role of disposition. Rather they should be considered objectively (through validated measure) and linked to context. In this way disposition is not seen as ‘the’ defining champion characteristic, rather it is one part of a complex construct.

As appreciated by Renken and Heeks (2014), generally studies into the ‘origins’ of champions; how and why certain individuals come to take championing roles are fairly rare, as a consequence there is limited consensus on the ‘born’ vs ‘made’ argument and the ‘emergent’ vs
‘appointed’ line of thinking. Indeed, the studies which have examined
the personality traits of champions infer that certain individuals may be
predisposed to championing due to the innate qualities they possess, and
those that do so emphasise a relatively narrow range of characteristics
(Renken and Heeks, 2014). Howell and Higgins (1990) make a valid
assertion on the work undertaken on such disposition studies; many
historical studies of championing in the innovation literature propose
characteristics that are formed from the researcher’s impressions of the
individual, rather than through validated personality tests. This points to
the need to employ a broader measure of personality in a manner which
allows for more objective consideration of such characteristics.

More generally, the proliferation of action-based studies has led to a
relative neglect of organisational context which, as appreciated by
Markusson (2010); Meijerink and Huitema (2010) and Taylor et al.
(2011), are vital for appreciating the champion endeavour. Indeed, the
confluence of action and structure as described by Markusson (2010)
necessitates an approach in which consideration is afforded to the
interaction between these dualities.

Given the peculiarities of public sector organisations as highlighted by
Winistorfer (1996) and Damanpour and Schneider (2009), greater
research is needed on champion emergence within public sector contexts.
How and why individuals come to champion in such contexts is
especially worthy of attention given the constraints inherent to the public
sector which supposedly act to stifle such innovative behaviour. A
critical part of the focus on organisational context is the ‘opportunity for
championing’ (Markusson, 2010), which should consider both action-
based and structural aspects to fully appreciate the role of individual
initiative in championing attempts and the interaction between action
and structure.

There is also a tendency in the literature to isolate (analytically) the champion from the innovation as well as from the organisational context, this has the effect of ‘black boxing’ the innovation. As a large technical system (LTS), district heating is at once socially shaped and socially shaping; the reciprocal nature of technological development requires an appreciation of the characteristics of the technology itself. As a large, complex infrastructure these features are likely to impose certain demands on the system building champion which influence champion behaviour (his/her system building strategies).

Also crucial to a greater contextual awareness is a greater appreciation of the social capital resources utilised by the champion, moving away from notions of the ‘heroic individual’. This may be particularly pertinent for DH initiatives which, as described by Bulkeley and Kern, (2006) as cited in Hawkey, (2009), cross-cut a number of different LA departments. This could potentially present a significant challenge given the supposed lack of joined-up thinking within LA’s (Larsson, 2006). Indeed, there is a need to incorporate into analyses the possibility of a ‘team effort’ in championing endeavours. The inclusion of ‘group’ into notions of championing helps to link the champion to his/her context and remove the tendency to portray the championing as the result of one heroic individual.

In light of these gaps in existing knowledge which are underpinned by the need to better address the interaction between action and structure, the notions of Human and Social capital (as employed by Jenssen and
Jorgenssen, 2004) provides a useful framework for analysing the champion phenomena. This could help to steer the debate away from strict delineations of agency vs structure to one in which the reciprocal relationship between the individual (his/her unique qualities), the social capital resources he/she exploits and the organisational context is appreciated. Before turning attention to the nature of the innovation, efforts will be directed to considering the concepts of human, social (organisational) capital in further detail.
CHAPTER 4: CHAMPION RESOURCES

4.1 Introduction
The notions of human and (organizational) social capital are particularly relevant to the study of championing, (as critical champion resources), providing a conceptual framework by which one can consider the interaction between the structural, and action aspects of championing endeavors (and is operationalized in Chapters 7 and 8). The following chapter provides an examination of the concepts of human, social and (organisational) social capital. A discussion is made of the utilisation of Organisational Citizenship Behaviours (OCB’s) as a critical way in which a champion may create vital forms of organisational social capital.

4.2 Human & Social Capital
It is argued that there are human and social capital features of championing that initiate action (Jenssen and Jørgensen, 2004). The authors, in their literature-based study, utilise a resource acquisition perspective, arguing that both the human and social capital features of the champion should be viewed as resources for the championing of innovation. Negoita et al. (2012), Coakes and Smith (2007) and Shane (1994) also stress the importance of the utilisation of social capital by champions. The literature contains various conceptualisations of social capital. The definition offered by OECD (2001, p.41) and utilised in Hawkey et al. (2010) is, “networks together with shared norms, values and understandings that facilitate co-operation within or among groups.” Coleman (1990, p.302) defines social capital as:

a variety of entities having two characteristics in common: They all consist of
some aspect of a social structure, and they facilitate certain actions of individuals who are within the structure...social capital inheres in the structure of relations between persons and among persons...it is lodged neither in individuals nor in physical implements of production.

OECD (2001) stresses that the concepts of human and social capital are related yet distinct; human capital resides in individuals, social capital exists in social relations whilst political, institutional and legal (PIL) arrangements describe the rules and institutions in which human and social capital work (OECD, 2001). Figure 4.1 displays the interaction.
Figure 4.1: The interaction of human & social capital and PIL arrangements

(Adapted from OECD, 2001).
As described by OECD (2001, p.13), “Human and social capital are closely related to the way in which institutions and political and social arrangements impact on society.” Social capital provides a basis for human capital, which as defined by OECD (2001, p.13), “represents the knowledge, skills and health embodied in individuals.” Jensen and Havnes, (2002) define human capital as the skills, experiences and competencies available to the champion, whilst social capital is the ‘information, trust and norms of reciprocity inhering in one’s social networks’ (Woolcock, 1998 in Jenssen and Jørgensen (2004, p.3). As Coleman (1988) and Woolcock, (1998) state, human capital cannot accumulate without a basis of social capital. Indeed, as Coleman (1988, p.10) further declares, “Human capital is created by changes in persons that bring about skills and capabilites that make them able to act in new ways,” whereas, social capital, “…comes about through the changes in the relations among persons that facilitate action” (Coleman, 1988, p.100).

Foley and Edwards (1999, p.141) in their review of the literature on social capital found that the way in which the notion of social capital is conceptualised and operationalised can vary in significant ways. It was found that research can be divided (on a roughly equal basis) into those who treat social capital as an independent variable and those who treat it as a dependent variable. The authors further delineate those who employ the concept in terms of norms, values and attitudes and those who choose a more social structural operationalisation (social networks, organisations and linkages).

The norms, values and attitudes (such as trust) which reside in individuals can be considered as important because as Coleman (1990) argues, the presence of such attitudes and behaviours provide resources for others who depend on them. An important point on the presence and distribution of norms is made by Foley and Edwards (1999, p.13) who suggest that before a norm could generate the
expectations that convert that norm to social capital, the norm would need to be widely known and accepted by those within the specific context studied.

Trust is a vital component of social capital. OECD (2001) define three types of trust, interpersonal (between family members or colleagues), interpersonal trust among strangers and trust in public and private institutions. Although, as prescribed by Foley and Edwards (1999), one should proceed cautiously when discussing social trust in generalised terms, particularly with the use of data aggregated employed to be representative at the national level, which in fact hold little regional relevance and can conceal significant differences within a society.

Foley and Edwards (1999) argue that studies of social capital should give due consideration to ‘access’ and ‘resources.’ Although it is proposed that neither resources, or attitudes and norms or social infrastructures such as networks (and associations) provide a sufficient understanding of social capital by themselves. The context is said to influence the ‘use value’ of social capital and ‘shape the means by which access to specific social resources is distributed and managed’ (Foley and Edwards, 1990, p.146). This, it is argued, may cause problems for macro-level assessments which generate aggregated ‘grand mean’ scores. Indeed, it is argued that a key reason why social capital is context specific is that social resources and access to those resources (the components of social capital) are not distributed evenly. As Foley and Edwards (1999, P.166) state:

*Both the resources present in a given social context and their potential value to individual or collective actors capable of accessing them are dependent upon the location of the specific social context within which the actor operates-whether an organisation, community, or a network-in the broader context of socioeconomic stratification.*
This is supported by Loury (1977) in Portes (1999) who writes how varying social contexts (with differing levels of access to information and opportunities) can dramatically alter the playing field for individuals of equal competence. Indeed, the local nature of social capital is reinforced by Khan and Muir (2006) who discuss the role of LA’s in nurturing social capital, as the closest form of the state to people’s lives. This is reinforced by OECD (2001, p.48) who discuss how social capital is sustained by organisations and communities as well as civil society (groups and organisations acting independently of the state/market for example labour unions or sports clubs). However as appreciated by Nyamori et al. (2012) who discuss Putnam’s assertion that the state cannot create social capital, it can through policy however, encourage its formation or destruction.

Portes’s (1998) insightful article on social capital and its applications in modern society make a number of noteworthy points relevant to the study of social capital. Firstly, he stresses the importance of distinguishing between the motivations of recipients and donors in social capital exchanges; the motivation of the donors are vital because they are, “the core processes that the concept of social capital seeks to capture” (Portes, 1998, p.6). Portes distinguishes (at a broad level) between consummatory and instrumental motivations. The former involving notions of bounded solidarity and value introjections and the latter being equated with reciprocity exchanges and enforceable trust. Discussing the tendency for confusion in the use and scope of the term social capital, Portes argues for separate analytical treatment of the possessors of social capital, the sources of social capital and the resources themselves. Portes writes of the recent tendency for a conceptual stretching of the notion away from an individual asset to a feature of communities and nations. This conceptual stretch, it is argued, poses certain difficulties; social capital is at once a cause and effect with positive outcomes such as low crime and its existence inferred from the same outcomes. The outcome becomes it is argued, either a circularity or a truism (which tends to be a relabelling of the original
problem to be explained). In order to avoid these pitfalls, Portes suggests that the definition of the concept must be separated (theoretically and empirically) from the proposed effects. He argues for some form of control to ascertain directionality so that social capital maybe clearly discernible prior to the desired outcomes. The next section examines social capital at the organizational level.

4.2.1 Social Capital in Organisations

As defined by Leanna and Van Buren (1999, p.3) organisational social capital is, “...a resource reflecting the character of social relations within the organization, realized through members’ levels of collective goal orientation and shared trust.” Social capital in organisations should, it is suggested, be considered as something which is possessed by the organisation and its members if it is to be useful in promoting collection action. Luthans et al. (2004) emphasise the importance to the firm in today’s environment (which necessitates flexibility, innovation and quick action) of developing and managing the knowledge, skills and experiences of employees, collectively known as ‘human capital’. Interestingly, Subramaniam and Youndt (2005), found that whilst both social and human capital are important for radical innovation, human capital alone is a necessary but not sufficient requisite for innovation. The authors provide the example of fiercely independent experts who are reticent to share their ideas within an organisation. As such social capital is a vital means by which the valuable individual knowledge is networked and shared and acted upon:

Individuals and their associated human capital may encourage the questioning of prevailing norms and originate new ways of thinking, but their unique ideas often need to be tied to one another for radical breakthroughs to occur social capital is pivotal to attempts to innovate (both incremental and radical innovations)
Leanna and Van Buren (1999) state that for organisations which are strong in social capital, mutual commitment is inherent in the relationship between employee and employer and also between organisational members. Social capital (relational contracts and norms) it is argued, can aid collective action through effectively becoming a substitute for more formal rules and controls, generating a, “general understanding of work organization, implicit norms, and generalized, resilient trust” (Leanna and Van Buren, 1999, p.549).

The onus in their study, and in the literature more generally, is on general employment practices, such as selection and promotion, as the key shaping factors of social capital for both the individual and the firm. It is argued that there are two key components of organisational social capital: associability; the willingness and ability of employees to forgo the individual benefits in favour of the collective good and trust; readiness of vulnerability (Leanna and Van Buren, 1999). Figure 4.2 illustrates the model of social capital in organisations developed by Leanna and Van Buren (1999). It shows how employment practices are shaped and results in the generation of organisational benefits such as flexibility, commitment and intellectual capital but also potential costs such as a loss of innovation.
Figure 4.2: Organisational social capital

(Leanna and Van Buren, 1999, p. 547)
The potential loss of innovation may stem from the focus on the collective workforce rather than individual incentives to innovate (Leanna and Van Buren, 1999). Coleman (1990) suggests that social capital may however stimulate innovation through the trust felt by employees which enables them to feel comfortable taking a risk. Ichniowski et al. (1996) and Levine & Tyson (1990) emphasise the importance of stability in worker-employer relations in instances of radical work process change. However, Coleman (1990) also stresses that strong norms, specified roles and long-term relationships can hinder change through maintenance of the status quo. Leanna and Van Buren (1999) emphasise the importance of appreciating the social context and emphasise social capital as an attribute of the collective, rather than the sum of employee’s social connections. Social capital is created and maintained when firms promote stability in employment, select and rewards employees who value collective working and adopt compensation practices that reward group over individual effort (Leanna and Van Buren, 1999).

4.2.2 A Good Organisational Citizen?

In contrast to Leanna and Van Buren, Bolino et al. (2002) adopt an employee centred perspective in their article, emphasizing the ability of the individual to create organizational social capital. Bolino et al. (2002) use the framework developed by Nahapiet and Ghosal (1998), who define three features of social capital; a structural dimension, a relational dimension and a cognitive dimension. Although there are a number of different frameworks for the study of social capital, Nahapiet’s and Ghosal’s is particularly useful for the study of intra-organisational social capital (Bolino et al. 2002). In addition, the authors integrate many of the key concepts social capital defined in previous studies (Bolino et al. 2002). The authors propose that organisational citizenship behaviours (OCBs)
play a strong role in the development of the three forms of social capital in organisations (Figure 4.3).

Organisational Citizenship Behaviours are defined as “employee behaviour that go beyond role requirements, that are not directly or explicitly recognised by the formal reward system, and that facilitate organisational functioning” (Organ, 1988 in Bolino et al. 2002, p.505). Although Organ (1997) later revised this definition following criticism that employee behaviour may not be always be voluntary (Morrison, 1994). He opened up the definition to the possibility of formal reward through the organisational system (Motowidlo, 2000). As Podsakoff et al. (2013, p.S89) discuss, those activities generally associated with an employees’ formal job description tend to be labelled ‘task performance’ and whilst positively correlated, they are conceptually and empirically distinct. Efforts to make clear this distinction have led to the identification of over 30 dimensions of OCB as discussed in Podsakoff et al. (2013). Podsakoff et al. (2013) draw the two main classification systems together to differentiate OCB’s according to who may benefit from them (OCBO’s benefit the organisation; OCBI’s benefit specific individuals and indirectly the organisation) and whether they are challenge-oriented (COCB’s) or affiliation-oriented (AOCB’s). AOCB’s are interpersonal and strengthen or maintain relationships, ‘helping behaviour,’ COCB’s challenge the status quo, ‘employee voice behaviour.’ Table 4.1 is taken from Podsakoff et al. (2013) and details the categorisation of OCB according to these two frameworks.
Figure 4.3: OBC’s and the creation of social capital in organisations

(Bolino et al. 2002, p.512)
## Table 4.1: Categorisation of OCB’s

(Podsakoff *et al.* 2013, p. S90)
The final column in Table 4.1, display the behaviours which although intended to benefit the organisation as a whole are neither interpersonal in nature nor challenging to the status quo. Challenge-oriented OCB’s have particular relevancy for championing behaviour; ‘voice’ making innovative recommendations for change in spite of opposition is an integral championing action. Likewise, advocacy participation, disrupting the status quo and showing a willingness to be controversial. The championing literature also presents champion behaviours that could be classed as OCBO’s such as tying the innovation to the organisational agenda (organisational loyalty/endorsement, support and defence of the organisation/compliance) and utilising rational, formal means of promotion (organisational obedience, compliance to organisational rules and procedures). In the OCB literature, the majority of studies focus on AOCB’s, whilst in the championing literature less attention has been paid to notions of helping and cooperation as ways of strengthening the relationships needed to progress his/her agenda. Although Mansfield et al. (2010) have acknowledged the parallel between OCB and championing behaviour showing a link between altruism and a propensity to innovate. The authors suggest that champions of innovation help those individuals who help them to progress their own agenda. As such the extent to which this can be classed as genuinely altruistic is debatable.

Mossholder et al. (2011) suggest that the decision to engage in helping behaviour is in part based on the trust that is inherent in the anticipated benefits from the relationship. Lemmon and Wayne (2014) suggest that altruistic concern rather than obligation is a better predictor of OCB towards an organisation. Mossholder et al. (2011) propose that organisations should harness helping OCB, stating that it is important not only for strengthening interpersonal relationships within an organization but benefitting the organization as a whole. Yaffe and Kark (2011) strengthen this assertion, writing that organisational leaders should ‘lead by example’ in terms of OCB to strengthen workplace belief in in its value.
**Structural Social Capital**

The structural dimension of social capital refers to the overall pattern of relationships in an organisation i.e. the degree to which employees in the organisation are connected to each other. Structural social capital refers to network ties and configurations (which provide information/knowledge/assistance) and the extent to which one can transfer different types of relationships within a network (network appropriability). It centres on the extent to which employees are connected, the patterns of connections and the usefulness of those connections across different contexts.

Jenssen and Jørgensen (2004) discuss the importance of both strong and weak ties to champions of innovation, “The structural position in the champion’s network may also influence the ability to promote innovations....” The authors cite Krackhardt (1992) who draws on Burt (1992; 1997) to argue that the opportunity to promote the innovation is a function of the existence of structural holes in the organisational network of the champion. These structural holes enable the access and utilisation of information from parts of the social system that would otherwise be unobtainable (Jenssen and Jørgensen, 2004). Shane (1994) Coakes and Smith (2007) and Negoita et al. (2012) also recognise the importance of social capital to championing attempts.

Platchkov and Pollitt (2011) suggest a link between social capital and the up-take of CHP-DH, suggesting (based on Spellerberg, 2001) that social capital may influence the processing of information, the assessment of risk and opportunities and the ‘checking out’ of situations, individuals and agencies. This may be relevant for the uptake of DH (DH-CHP) the authors argue, due to the high investment costs, mix of users required for economies of scope, low regulation and the need for cooperation between many different stakeholders. Likewise, Kelly and Pollitt (2010) suggest that greater levels of local social capital (suggesting typical measures as described by Pollitt (2002) including social networks, trust and civic engagement) would help the formation and financing of local working groups that could consider and promote DH- CHP. However, limited data
availability and/or quality restricted their study and limited the confirmation of their assertions. Indeed, as appreciated by OECD (2001) the measurement of social capital is a very difficult task; sources and outcomes may become confused, social capital aspects are composed of relationship features which by their very nature are hard to codify and more generally there is a lack of suitable data sources.

Hawkey et al. (2013a, p.2) discuss the role of social capital in the development of the varying organisational models associated with DH development:

*Local developers are reliant on sources of social capital to make systems work, given limited support from public policy and limited access to finance. Local actors, drawing on non-local community energy and commercial and technical networks of expertise, work to: introduce the technology into strategic planning; establish its legitimacy and the legitimacy of a form of multi-organisation suited to numerous stakeholders; secure finance; negotiate risks and responsibilities; and engage with energy markets designed for large scale centralised provision.*

Hawkey et al. (2011) suggests that social capital is likely to play an important role in the organisation of resources (both local and non-local) including legal, financial and commercial knowledge, suggesting it is an important factor for structuring and maintaining local energy governance organisations (LEGO). Social capital in Hawkey’s study was argued to be a central resource for local learning; national or international networks of expertise, helping to create legitimacy for the technology and strengthen the role of the LA in development. Hawkey et al. (2013a) discuss the important of bridging capital (which connects together different types of actors) for ‘disruptive’ technologies (Tura and Harmaakorpi, 2005 in Hawkey et al. 2013, p.7). The authors offer valuable insights into the formation and organisation of LEGO’s, reinforcing the notion that the weak ties in a network can be as valuable if not more valuable that the strong ones, as described by Tura and Harmaakorpi (2005) in Hawkey et al. (2013). Granovetter (1973) (as cited by Portes, 1998) explains this is as the, ‘strength of weak
ties.’ Bolino et al. (2002) suggests that these weak ties enable access to unique information and resources that would not exist within existing (dense) cliques. This argument was further developed by Burt (1992) and his ‘structural holes’ theory which dictates that social capital is grounded in the relative paucity of network ties rather its density (associational density). Individuals fill structural holes between otherwise unconnected networks in order to obtain access to unique and timely information (Bolino et al. 2002). Leanna and Van Buren (1999) make an interesting point regarding the existence of structural holes, suggesting that their emergence may be due to either a lack of information within the firm or inefficient sharing of the information. In the case of DH, the existence of LA structural holes in this context could arguably be due to a lack of information on what is a specialist subject, placing a high ‘use value’ on bridging social capital as discussed by Hawkey et al. (2013).

Relational Social Capital

The relational aspect centres on the nature and quality of the connections between employees, focusing on trust, shared norms, perceived obligations and mutual identification. Bolino et al. (2002) draw a parallel between relational social capital and Granoveter’s (1973) notion of ‘strong ties.’ Relational social capital centres on the extent to which employees like each other, trust one another and identify with each other. The authors argue that there may be less resistance to change when employees like one another and they consequently may be more flexible and adaptable (Bolino et al. 2002). Jenssen and Jørgensen (2004, p.70) discuss the importance of social capital resources in championing endeavours stating, “The emotional component in friendship relations is essential in order to understand the dynamics involved in organisation crises and changes.” The authors discuss how the confidence organisational members have in the champion is the kind that is found in close relationships between friends (Krackhardt (1992 in Jenssen and Jørgensen (2004). This assertion hints at the importance of relational social capital for champions of change.
Cognitive Social Capital

The cognitive dimension refers to the extent to which employees possess a common understanding or perspective through a shared language/codes (a common language) and shared narratives (stores, metaphors, myths) Nahapiet and Ghosal (1998). Like the relational aspect of social capital, cognitive social capital involves connections of an affective nature (Bolino et al. 2002). It begs the question of whether employees genuinely understand one another.

Bolino et al. (2002) propose that citizenship behaviour in employees contributes to the development of all three forms of social capital in an organisation. The authors contend that scant regard has been given to the effect of individual action on the development of social capital within an organisation. The authors draw a parallel with work on notions of citizenship in the community. It is proposed that ‘good organisational citizens’ are highly relevant for the creation of social capital in organisations. In their study, Bolino and his fellow authors employ the conceptualisation of organisational citizenship advocated by Graham (1991), which is grounded in political philosophy and modern political theory. This proposes that there are three forms of organisational citizenship: Obedience, Loyalty and Participation.

Van Dyne et al. (1994) later built on this foundation through empirical investigation to elucidate that ‘participation’ should be considered as taking three forms: Social participation involves an employee’s active involvement in company business or engagement in social events within the firm. Advocacy participation is defined as the propensity of employees to be controversial in their aims to improve the organisation through for example, innovating. It is proposed that the more open to individual expression a work environment is, the more likely a shared language and narratives are
to develop (Bolino et al. 2002). Lastly, functional participation requires employee’s to exceed their work standards, typically going ‘above and beyond’ the call of duty.

The impact of particular personality features (as well as attitude to work) is indicated by Bolino et al. (2002) as influencing the likelihood of performing functional participation activities, such as high levels of conscientiousness. The authors also suggest that the relevancy of each type of social capital may vary according to the organisational type; cognitive social capital is thought to be beneficial in organisations which focus on knowledge-development (Nahapiet and Ghosal, 1998); structural social capital may be critical to dynamic environments which rely on the efficient exchange of information and relational social capital may be necessary in instances which necessitate a high degree of task interdependence. This points to the importance of contextual awareness and in this study how the LA as a public sector organisation may necessitate certain types of social capital. OCB’s are argued to be important contributing factors to the development of social capital in organisations; increasing networks ties, altering configurations of contacts (structural social capital); infusing (and strengthening) relational capital with an affective component; enhancing collective understanding (improving cognitive social capital).

Bolino et al (2002) discuss earlier assertions in the literature which suggest that altruistic behaviour creates an indebtedness which acts to engender cooperation and a feeling of reciprocal positivity for both parties. Indeed Mansfield et al. (2010) in their study on the personal characteristics of innovation champions drew on Podsakoff et al.’s (1990) conceptualisation of OCB. The authors found that altruism was a prevalent feature of the champion, however they suggest that this may be considered as “helping others advancing the innovation then helping others supporting the individual personally” (Mansfield et al., 2010, p.1143).

Bolino et al. (2002) discuss the relevance of informal socialising between colleagues and its positive effect in the workplace setting. Indeed, it is suggested that the stronger
the interpersonal connections between employees (relational aspects of social capital including trust, shared norms, perceived obligations and mutual identification) the more flexible workgroups are and more adaptable to their environment. Furthermore social interaction has been found to be an important influencer on group cohesion. Trust, it is argued, promotes social and resource exchange (Jones and George, 1998; Misztal, 1996; Putnam, 1993; Tsai and Ghosal, 1998 in Bolino et al. 2002). This in turn may increase both innovation and teamwork (Bouty, 2000; Jones and George, 1998). Those who are viewed as working for organisational goals and not purely self-motivated are the most likely to engender trust (Lewicki, et al. 1998). This has important implications for those who champion initiatives; should they wish to engender the trust and ultimately the support of colleagues, they will need to be very careful about how others perceive them in terms of their motivations and consequently how they frame their proposal. An important component of trust is the predictability of others (Bolino et al. 2002), as such obedience (adherence to the rules and regulations of the organisation) may have an important impact on inter-employee cooperation. This insight has potentially significant implications for the way in which a champion pursues his initiative; whether to pursue formal (rational) routes or more radical measures may have an impact on the likelihood of engendering organisational support.

Whereas weak ties are acknowledged as useful, particularly in instances which enable access to previously unobtainable information or knowledge, strong ties between employees enable individuals to identify with each other and enhance communication, cooperation and concern for group outcomes (Campion et al. 1996 in Bolino et al. 2002). Bolino et al. (2002) argue that OCB’s help to foster the affective element of these connections, suggesting that when employees go ‘above and beyond’ they help to develop a workforce of employees who have mutual trust, identification and friendship. In terms of cognitive social capital (shared perspective), it is proposed that through OCB, employees’ ability to understand each other is enhanced. Although, as acknowledged by Bolino et al. (2002), strong interpersonal relationships can in some
instances act to stifle change or creativity in some instances and hinder innovation. As well as arguing more generally for an approach that highlights the specific instances when social capital (and the citizenship behaviour that supports it) is most likely to affect significant results, Bolino et al. (2002), argue that more work is needed on understanding the relationship between social capital and organisation type (knowledge-development focused for example) and the nature of the environment (such as dynamic, fast paced).

4.2.3 Personality and Social Capital

The subject of personality appears very rarely in the literature on social and human capital. Indeed, Kalish and Robins (2006) discuss the relative neglect of a consideration of personality in network research, echoing Burt et al.’s (1998, p.63) contention that, “In our fascination with the nuances of social structure and processes revealed by network analysis, it is easy to neglect the individual personalities chained together by the network.” It is argued that network theorists more generally consign personality to a function of the history of network positions they have occupied, delving no further analytically. This is recognised by Totterdell et al. (2008) who suggest that individual psychological attributes are important as they contribute to the development and maintenance of ties within networks and consequently influence the behaviour of those networks. Essentially, the personalities of the human ties that form social structures matter. In Totterdell et al.’s study extraversion was significantly correlated with the propensity to connect with others (PCO) and to a lesser extent emotional stability. Burt et al. (1998) examined personality and structural holes, finding that those individuals in the least constrained networks display personality features of the entrepreneurial outsider, in contrast to the conforming and obedient insider, who seek authority rather than security, who thrive on advocacy and change rather than stability. Although this, it is argued, may hold relevance only for lower rank employees. Kalish and Robbins
(2006) acknowledged the relevance of personality considerations in their study based on the Big Five personality traits. It was found that those individuals who maintain structural holes in their networks generally score highly on extraversion ratings and less on individualism compared with those with closed networks of strong ties. In their study, Scheufele and Shad (2000) establish the importance of ‘personality strength’ for the development of social capital. This is defined as self-confidence in one’s leadership position, the ability to shape opinion and an individual’s perception of their ability to influence social and political outcomes. As the author’s state:

*It matters normatively as an important antecedent of trust and engagement; it should also matter for researchers studying participatory processes, in particular, and social capital, in general, as a variable that has an impact in conjunction with but also beyond informational variables* (Scheufele and Shad, 2000, p.125)

Jenssen and Jørgensen (2004) incorporated personality characteristics as part of the human capital features of champions in their literature-based study on championing behaviour. The notion of human capital is generally based on ability through the acquisition of knowledge/experience; “the knowledge, skills, and abilities residing with and utilized by individuals” (Schultz, 1961), “being embodied in the skills and knowledge acquired by an individual” (Coleman, 1988, p.100), “human capital is reflected by education, training or experience” (Bolino et al. 2002), “knowledge and technical ability” (Leanna and Van Buren, 1999, p.539), “human capital…. Deriving from education and training” (Tomer, 2003 p.454). There is, on the whole a general lack of inclusion of personality in these notions, or what Luthans et al. (2004) term ‘who I am?’ It is the contention of this study that a broad definition of human capital is necessary lest researchers may ignore an important dimension of championing action. As previously acknowledged, Totterdell and Hukin (2008) state that the personalities of human ties that form social structures are important. OECD (2001, p.18) supports this proposition, writing that human capital may contain aspects that have an emotional,
motivational and behavioural dimension, suggesting a broad definition for human capital, “The knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being.”

Indeed, a valid point is made by OECD (2001) who discuss the dynamic nature of human capital; it can grow through experience and likewise depreciate through lack of use. It is a multi-faceted concept, skills can be general or highly specific, context-dependent and tacit in nature (OECD, 2001). There are some who argue that psyche resources warrant a separate analytical treatment.

4.2.4 Psychological Capital

There is a movement which stems from positive psychology and positive organisational behaviour (POB) that argues for the inclusion of another form of capital, which they believe has been relatively ignored, ‘psychological capital’ (PysCap). Its main proponents Luthans et al. (2004, p.45) denote:

*With the rising recognition of human resources as a competitive advantage in today’s global economy, human capital and, more recently, social capital are being touted in both theory, research and practice. To date, however, positive psychological capital has been virtually ignored.....”Who I am” is every bit as importance as “what I know” and “who I know."

The authors suggest that efforts should now be directed to ‘go beyond’ both human and social capital assets to consider psychological capital. Drawing on positive psychology and ‘positive organisational behaviour,’ it is argued that more attention should be given to harnessing the personal strengths and ‘good’ qualities of employees, ‘positive psychological capital’ (Luthans et al., 2004, p.46). The four positive psychological
capacities (psychological resources) of Confidence, Hope, Optimism and Resilience are applied to the workplace and their contribution to positive psychological capital is discussed. Luthans et al. (2007, p.3) thus define psychological capital as:

...an individual’s positive psychological state of development that is characterized by: (1) having confidence (self-efficacy) to take on and put in the necessary effort to succeed at challenging tasks; (2) making a positive attribution (optimism) about succeeding now and in the future; (3) persevering toward goals and, when necessary, redirecting paths to goals (hope) in order to succeed; and (4) when beset by problems and adversity, sustaining and bouncing back and even beyond (resilience) to attain success.

Luthans et al. (2004) emphasise that these capacities are temporal in nature, i.e. they are not fixed in the sense of psychological traits rather they are states of being which are therefore open to development and management. The delineation between permanent individual characteristics and state characteristics; those which are influenced by context and current circumstances is discussed by Kalish and Robins (2006). PysCap resources lie in between pure states (intelligence) and trait-like constructs and as such are more stable than moods and emotions but not as fixed as personality traits. Whereas psychological capital can be considered as a temporal state of being, personality dimensions are more permanent features of an individual. Inherent to the idea of PysCap is that of self-improvement, it adopts a positive proactive stance (Luthans, et al. 2007). Luthans et al. (2004) make the delineation between human capital (what you know), social capital (who you know) and positive psychological capital (who you are).

The idea of psychological capital proposed by Luthans et al. (2004) and described in Luthans et al. (2010) is useful in directing attention in studies of social and human capital to the potential significance of features of the individual’s psyche. Its main proponents state that it can be induced and harnessed in order to increase these potential sources of competitive advantage, through for example, higher productivity, improved customer
service and greater employee retention (Luthans et al. 2004). PysCap are resources which can be managed and developed through, for example, training programmes. Whereas traits have a degree of stability, PysCap promotes the argument that the ‘who I am’ element can be changed and altered for the purpose of organisational will. Although Choi and Lee (2014) have argued for the extension of the concept, away from workplace conceptualisations, citing Wright’s (2003) contention that a valuable contribution to the field of POB must consider employees as more than simply cogs in the organisational machinery. However, the empirical and theoretical robustness of PysCap is yet to be fully established and whilst its potential is significant, in terms of the present study on championing, personality traits offer a more robust and relevant basis for consideration of the role of personality-related dimensions in championing behaviour. Indeed the ‘who you are’ question underpinning the notion of PysCap cannot be answered in its entirety be focusing purely on temporal states of being, it is proposed that in order to be more robust the definition of Human Capital (if not positive PysCap) should be widened to encompass other facets of a persona, including personality traits. In addition, in comparison to the examination of positive psychological capital, the study of personal attributes through examination of traits enables one to objectively assess both the positive and negative aspects of personality which may impact upon utilisation of social capital resources.

The limitations of employing a trait-based approach to personality study is appreciated by Kalish and Robbins (2006). The authors discuss the trend to move from broad traits to specific behaviour-orientated ones that could capture more specific behavioural outcomes (Block, 1995; Briggs, 1989 in Kalish and Robbins, 2006). The authors particularly mention skills relevant to bridging such as self-efficacy or political skills which may be particularly pertinent for studies of social capital. However, in light of the importance of considering the impact of personality when studying the human and social capital aspects of the champion, and in spite of acknowledging the early promise demonstrated in the concept of psychological capital, it was deemed more pertinent in
keeping with the literature on championing activities, to consider the more permanent trait-like features of an individual which may assist or hinder an individual when championing a technological innovation. In addition as asserted by Choi and Lee (2014), there is still work to be done empirically on demonstrating the validity of the concept. Choi and Lee (2014) in their study found that failure to consider personality traits might engender a positively biased estimation of the effect of PysCap. Importantly, as John and Srivastava (1999) contend, the Big Five structure does not dictate that all personality differences can be reduced to just five traits, rather the traits represent personality at the broadest level of abstraction. Indeed each dimension consists of a large number of more specific personality features.

4.3 Chapter Conclusions

This chapter has identified the relevancy of the concepts of human and (organisational) social capital for the study of champions of innovation. Organisational Citizenship Behaviours (OCB) have been highlighted as having an important influence on the ability of an employee to create (organisational) social capital (Bolino et al. 2002). OCB’s have been shown by Bolino et al. (2002) to be important contributors to organisational social capital, creating the structural, relational and cognitive dimensions and Mansfield et al. (2010) have made in-roads into the study of OCB and championing, highlighting altruistic tendencies as relevant. The emphasis on the power of the individual to create social capital at the organisational level, in Bolino et al’s study, is pertinent to the study of champions who act to instigate often significant organisational change. As has been highlighted by Jenssen and Jørgensen (2004), as well as, Shane (1994); Negoita et al. (2012) and Coakes and Smith (2007), champions of change rely on the exploitation of social, as well as human capital. It is anticipated that utilisation of these concepts, may enable greater balance may be had between aspects of context and action, which a balanced championing account requires. The following chapter considers the key
sociotechnical features of DH as an important way of shedding light on the nature of the innovation being championed.
CHAPTER 5: THE SOCIOTECHNICAL NATURE OF DISTRICT HEATING

5.1 Introduction

The purpose of this chapter is to conceptualise district heating as a large technical system (LTS), and in doing so highlight the importance of a sociotechnical approach, which appreciates the reciprocal nature of technological development. The emphasis on contextual development and agency integral to sociotechnical approaches (Bolton, 2010), is useful for balancing action with context in considering the DH Champion. Central to the LTS theory is the ‘system builder,’ who akin to the champion of innovation, works tirelessly in pursuit of system development. The relevancy of the system builder concept for the study of DH championing will be revealed.

5.2 Sociotechnical Studies

Sociotechnical approaches to technology adopt a position that rejects technological determinism i.e. the passive view to technological change which espouses that technology just changes, as a result of science or of its own accord (MackKenzie and Wajcman, 1999). Sørensen and Williams (2002) draw a parallel between technological determinism and economic determinism, stating that both stand points are far too simplistic to accurately explain how invention and innovation occur. As Russell (1986, p.15) surmises:

*It is the ontological and epistemological relations of technology as mediator between human activity and the natural world-its use of physical properties, its*
ability to transform physical reality, and its reliance on knowledge of that reality—
which crucially have placed knowledge about technology outside most traditions
of social inquiry.

Williams and Edge (1996) write of the emergence of the Sociology of Technology
which stems from an approach employed in the History and Sociology of Science.
The approach utilises the concepts of contingency and interpretative flexibility to
examine ways in which technological artefacts could be designed in more than
one way, the choices between different technical options and why a certain
 technological design prevailed over another. As Williams and Edge (1996) further
note, this approach proceeds ‘outwards’ from the technology itself to the context
shaping it. During the 1980s a new branch of the Sociology of Technology studies
emerged, coined the Social Shaping of Technology (SST).

The movement stresses the importance of agency and contextual development as
well as the content of technology and the processes involved in innovation
the sociotechnical approach is ‘not a single unified theory,’ rather it is a research
approach which offers contextualised accounts of technological developments in
which contingency and agency are pivotal to analysis. As expressed by Russell
(1986), technology should be viewed as a social product; a crucial part of social
activities and relations and as an outcome of them in terms of form and content.
As delineated by Russell (1986), of key importance should be:

- The ways in which technology confronts and affects different social groups
- Understanding the character and role of the institutions dealing with
technology
- The knowledge both in and about technology.
MacKenzie and Wajcman (1999) also emphasise the important role of state or Government in shaping the fortunes of technology through sponsorship. Indeed, Government intervention in energy markets can have a significant effect on the prosperity and superiority of certain technologies. MacKenzie and Wajcman (1999) stress, however, that technology is not the result of the actions of one set of dominant actors, pointing to the need to recognise the role of the unruly material world. Certainly, the social shaping of technology is by and large a process in which there is no single dominant shaping force. Furthermore, Van der Vleuten and Kaijser (2006) stress the importance of acknowledging that technological change is not a straightforward, rational process. Instead it must be considered as messy, complex and “intertwined with the hopes and agendas of many historical actors, negotiations, and conflict-ridden economic or political contexts” (Van der Vleuten and Kaijser 2006, p4).

This brings with it the notion that a particular technology may have a better ‘fit’ in a certain social environment. Chandler (1977) in MacKenzie and Wajcman (1985), for example, suggests that large-scale systems may require ‘centralised, hierarchical managerial control.’ This naturally engenders the question of whether the social conditions are a requirement of the system and whether these conditions are internal/external or both. It begs the question of whether the current state is a result of “unavoidable social response to intractable problems in the systems themselves, or.... A pattern imposed independently by a governing body, ruling class, or some other social or cultural institution to further its own purposes” (Winner, 1980, p.35). These issues are echoed in the ‘Transfer’ stage of Systems development; the idea that a system may have certain characteristics that are necessary for its survival in a particular time and place, and that transfer to another time/environment may pose considerable difficulties.

As purported by Bijker et al. (1987), the social study of technology has been
characterised by three trends:

- A movement away from the notion of an inventor ‘genius’
- A rejection of technological determinism
- A tendency to remove the distinctions between the technical, social, economic and political aspects of technological development, promoting instead the idea of a ‘seamless web’ of society and technology.

The ‘seamless web’ embodies ‘a multitude of scientific, economic, political and institutional components’ (Summerton, 1992, p.64). As Bolton (2010) notes, the way in which each system interacts with its environment produces a ‘technological style’ that is dependent on the context in question. As noted in Bijker et al. (1987) the Systems approach, exemplified by Hughes emphasises the importance of an appreciation of the different interconnected elements of physical artifacts, institutions and their environments, promoting an integration of technical, social, economic and political aspects. Bijker et al. (1987) writes of Thomas Edison, who mixed matters economic, technical and scientific, so much that his thoughts composed a ‘seamless web.’ The notion of a ‘seamless web,’ however, brings into question the issue of boundaries; where does the boundary end and the environment begin? In Systems thinking, an organisational aspect which may typically be considered a part of the environment, when discussing ‘the social context of technology,’ are actually system-builder creations (Hughes 1987). Thus, the system-builders strive to bring aspects of the environment under their control; if one exerts control over an environmental aspect it then becomes part of the system. Although, rigid delineations between system and environment can be complex and not wholly necessary, ‘depriving the analysis of all its descriptive
and explanatory value’ (Callon 1987, as cited in Summerton 1992, p.100-101). The tensions between the delineation of system builder creations and aspects of the environment are echoed in the championing literature. Markusson (2010), for example, advises caution when considering ‘structure’ and ‘context,’ explaining that certain aspects of the organisational context of the individual are deemed as structural from the point of view of the employee, but may be deemed action dimensions from the perspective of the organisation. The Large Technical Systems (LTS) theory will now be examined in further detail as one of the main theories which deals with the notion of a seamless web. The actor-centric approach is deemed highly relevant to the study of district heating champions.

5.3 District heating as a Large Technical System

As acknowledged by Bolton (2010), since the 1980s a school of thought has emerged which aims to develop an understanding of the emergence and evolution of infrastructure through the adoption of a sociotechnical perspective. The theoretical approach of LTS builds on the Systems approach developed by Hughes (1979; 1983), who along with, Bloch and Braudel, view ‘large technical systems’ as ‘new, human-made deep structures in society’ (Van der Vleuten 2004, p.399). Summerton (1992, p.68) further discusses the debate on whether DH can be a considered an LTS (given that DH systems are inherently local):

*the point is that a DH system can be regarded as an expression of systematic technology which reflects characteristics that are commonly associated with many of the systems known as ‘large technical systems’.*

Two recent in-depth studies which draw on sociotechnical theories in their study of DH in the UK are Hawkey (2009) and Bolton (2010). Both authors situate their
work in the Innovation system perspective that draws on Institutional theories and Evolutionary Economics. Hawkey explored the likely fortunes of DH in the UK context by employing and adapting a Technological Innovation Systems (TIS) framework. The goal was to understand the prospects of DH with an emphasis on policy interventions. A range of features of UK DH were defined; the study was useful in illuminating the role of the Local Authority and the structure of local Government which influences LA involvement with DH projects. An appreciation of the sociotechnical nature of DH systems is adopted, however, by assuming a more macro-level approach the practicalities of system building have been somewhat neglected.

Ronan Bolton explored the dynamics of contemporary energy systems in his thesis; two case studies are developed, uncovering the socio-technical processes inherent in distribution networks. Like Hawkey (2009), Bolton also draws from the Innovation study literature, employing economic and instutional theories as well as sociotechnical transitions, namely the multi-level perspective (MLP). In light of his objectives to explore the interplay between actors, institutions and technologies in energy networks and governance issues, ‘micro level firm and project level approaches were rejected in order to capture the influence of these structural dynamics’ (Bolton 2010, p. 88). However as Bolton (2010, p.284) acknowledges himself:

*On reflection, while this level of aggregation provided valuable insights into the meso-level governance processes taking place in the two cases and has been a useful starting point for transitions related research in this area, it perhaps has down-played the influence of micro-level agency.*

Bolton provided useful insights into the dynamics of energy systems and the role of key actors such as the Local Authority, as well as extending the knowledge on
the role of the state in energy matters. However, the adoption of a more actor-centric approach could enable a greater appreciation of the practical realities of district heating development. An examination of the key features of the LTS theory will now be made.
5.3.1 System Development

Hughes’ phases of growth were based on the study of a number of large technological systems in the history of electric light and power (during the period 1870-1940). It is important to note that the phases do not follow a sequential flow. Indeed, as with other aspects of LTS, the phases of System Development and the issue of system stability and change is much contested. Summerton (1994) proposes that ‘closed systems’ can open up and adapt to new circumstances, internal or external, in contrast to Hughes’s original conceptualisation in which only extreme circumstances such as war could alter the technological development. Summerton (1992) further rejects the sequential phases of system development, distinguishing instead alternate phases of relative stability and radical reconfiguration.

The first phase moves from radical invention resulting in new technological systems through to the development stage which involves embedding new technological systems in the political and economic roots needed to survive. Next comes Innovation which involves “putting the system into efficient use” (Joerges 1988, p. 12).

The next phase is called transfer, which could occur at different times in the history of the system. This involves the adaption in terms of problems and solutions of the new system to a different environment to the one the system has been developed in, resulting in what is termed, ‘technological style.’ Technological style, as stated by Joerges (1988, p.12) is, “the widely varying shape ‘one and the same’ technology takes under different geographical, political, legal and historical conditions.” This, as Joerges (1988) suggests, hints at the ‘creative latitude’ of system builders. Bolton (2010, p.40), discussing Hughes’s (1983) application of style in his cross country/city comparison of London, Berlin and
Chicago notes:

...how cultural, political and social differences between countries were reflected in the technologies that were adapted. The style of each system was found to be based on entrepreneurial drive and decisions, economic principles, legislative constraints or supports, institutional structures, historical contingencies, and geographical factors, both human and natural.

The following phase moves from growth through competition to consolidation, necessitating according to Hughes (1979), the requirement of different system builder roles; manager-entrepreneurs and then financier-entrepreneurs now take centre stage as the main goals become rationalisation, efficiency and capital intensification. Expansion, as denoted by Hughes (1987 as cited in Bijkber et al. 1987), is partly the result of the need for greater levels of diversity, load factors (the ratio of average output to the maximum output during a specified period) and a sound economic mix. A key feature of the Systems theory is the ‘reverse salient’ which poses a ‘critical problem’ to system development (Summerton, 1992).

5.3.2 Reverse Salients

As expressed by MacKenzie and Wacjman (1991), the need for the part to integrate the whole imposes constrains on how that part should be designed; the integration of technologies into systems produces a pattern of innovation called ‘reverse salient’. As Summerton (1992) discusses, the system builder defines the reverse salient as a set of ‘critical problems, ’to be solved. Bolton (2010) draws a parallel between reverse salient and the notion of ‘interpretive flexibility’ in the Social Construction of Technology (SCOT) school of thought, where multiple outcomes are possible. As Bolton (2010) notes, there can be a conflict between
conceptualised solutions to a critical problem, citing the early competition between alternating current (AC) and direct current (DC) systems.

Summerton (1992) points out that different reverse salients necessitate different problem-solvers, be it inventor, engineer, manager etc. Critically, as defined by Hughes (1983) in MacKenzie and Wajcman (1991), reverse salient only have meaning when a technological system is oriented to a goal. Hughes in Joerges (1983) emphasises the importance of system builders who provide effective and unlikely solutions to problems who are often independent or external to the organised management of the system. Joerges (1988) defines:

**Conservative improvements** are brought about by the engineering expertise of the managerial organisation of the system itself.

**Radical inventions** are those solutions provided by independent professional inventors due to an inability of the managerial organisation of the system to find a solution.

As Magnusson (2013) notes, once a system has gained enough size and power, it gains an ‘inertia towards change’ and reaches momentum. The social force of ‘momentum’ as defined by Hughes (1983), has important implications for the expansion phase; a common system culture becomes a strong force for expansion in itself. The system culture is based on a group of tightly-knit experts who share common values and views about the future direction of the system. A significant micro-level impact on expansion is the reluctance of existing system users to change their entrenched habits and practices; system builders must work to overcome entrenched attachments.
5.3.3 System Builders

“System builders [Edison, Insull and Mitchell] were strong holistic conceptualisers and determined solvers of the problems frustrating the growth of systems.” (Hughes, 1979, p.125) The early development of an LTS is undertaken by ‘System Builders’ who, according to Hughes (1983, p.20), “build a bridge between resources and demand.” This inclusion of agency into analysis is in contrast to general systems approaches (Van der Vleuten, 2006). As Bolton (2010, p.40) notes, System Builders are innovators akin to Schumpeterian entrepreneurs, who invent and commercialise individual technologies, components and “the systems within which they are deployed.”

Hughes (1983) suggests that multifaceted problem-solving is undertaken by a host of purposeful, highly entrepreneurial System Builders such as inventors, engineers, managers etc. Successful system builders have clear visions of the interconnectedness of the whole system and what is required to reach their goals. These System Builders are generalists rather than specialists, constantly managing a range of interrelated scientific, economic, political and institutional factors. Summerton (1992, p.65) citing Hughes (1983) writes that, “…Systems builders continually strived to make regulators and others subject to their control and sometimes succeeded.”

Several core principles that encompass personal traits/behaviour as well as contextual factors can be established from Hughes’s (1979) study of System Builders:

- The definition of a problem and the vision to solve that problem
- A system is a coherent whole and problem solving is related back to this whole
• The problem to be solved will change as the technological system grows and thus necessitate different system building skills
• Actions are purposeful and methodological, ignoring boundaries between disciplines
• Human and technical aspects are integrated into the system which involves the creation of a ‘community’ of experts
• Solving the problem requires talented people with a variety of skills
• A system builder and his team must be dedicated, showing complete commitment to the task
• As the system expands an awareness of technological trends is required, including study trips to visit other system builders potentially in different countries.

A number of parallels can be drawn between the concept of the system builder and the champion of innovation. Common to both conceptualisations is the need to show dedication, commitment and working beyond what is expected, “the working day sometimes extended nearly twenty-four hours” (Hughes, 1979, p.130). Akin to the champion who must build support for the initiative, the system builder must enrol a variety of talented people with complementary skills. Both must stay ahead of technological trends and advancements; for the champion knowledge of industry and competitive issues is particularly useful in framing the initiative as urgent. Critically, both concepts emphasise the role of a central actor in the process of change. Although, as discussed by Summerton (1992), studies of system building have been criticised for failing to fully account for the contested nature of technological change. Geels (2004) discusses the voluntaristic tendencies of System Builder conceptualisations and the importance of appreciating contextual factors, whilst also recognising that ‘actors carry and (re)produce the rules in their activities’ (Geels, 2004, p.903). As Geels further
...this ‘duality of structure’ has been well theorised in sociology, yet the discipline entirely neglects the material nature of modern societies...human beings in modern societies do not live in a biotope, but in a techno tope....these technologies.....shape our perceptions, behavioural patterns and activities. Sociotechnical systems thus form a structuring context for human action.

It is further argued that rules are not only shared in social groups and inside actor’s heads but can be embedded in artefacts and practices (Geels 2004). Indeed, Rip and Kemp (1998, p.340) define the ‘technological regime,’ (skills and procedures, ways of defining problems and handling relevant artefacts or persons etc.) as embedded in infrastructures and institutions. As Geels (2004, p.908) notes:

*Sociotechnical systems are maintained and changed by activities of actors, on the other hand, they form a context for actions. We can understand these actions as moves in a game, of which the rules somewhat alter while the game is being played.*

Geels further explains that rules and regimes constitute a game that is played out by actors, users, suppliers, public authorities etc. who have their own perceptions, aims resources etc. Each actor/group acts to achieve these aims and their interactions can be viewed as an ongoing game of reactions with each other (Geels, 2004). An important point to note is that the share of resources, opportunities and thus power is unequal, leaving the possibility for conflict and power struggles (Geels, 2004). Some argue that LTS does not fully account for this conflict (Van der Vleuten and Kaijser, 2004).

Critics of the LTS approach have suggested an over emphasis on the ‘heroic’ system builder and have also called into question the relevancy of the theory given
its portrayal of systems in a time of centralised state control (Hawkey, 2014). Importantly, however, as Van der Vleuten and Kaijser (2004) note, ‘system builders’ can be organisations, Governments, or even a cooperative of actors or organisations. Likewise, for Summerton (1992) the system builders were the Directors, Managers and other members of the DH divisions of the Energy Company. Summerton (1992) further acknowledges that many actors within a multiorganisational system essentially act to ‘build’ the system. Van der Vleuten (2006) further writes of the importance of recognising the role of both visionary individuals and larger organisational bodies in system establishment. Disco and Van der Vleuten (2002) extend the system builder concept to that of competing organisations in their study on ‘wet system building’ in the Netherlands. This widening of the concept allows for more current conceptualisations of the ‘system builder,’ and thus helps to ensure that the LTS notion of ‘system builder’ remains relevant and crucially highly specific to the system to be studied. Also, as appreciated by Van der Vleuten and Kaijser (2004), system builders do not act in a vacuum; contextual factors must be accounted for. As Geels (2004) states:

*Because of their emphasis on product champions ‘heterogeneous engineers,’ ‘system builders’ (Hughes, 1987) these approaches sometime tend towards voluntarism, with strong heroes shaping the world at will. To counter these tendencies attention also needs to be paid to existing rules, regimes and institutions which provide constraining and enabling contexts for actors (individual human beings, organisations, groups). Perceptions and (inter)actions of actors and organisations are guided by these rules (‘structuration’).*

However, as Hughes’s (1979) in his historical account of three key System Builders integral to the development of the electricity system in America (Thomas Edison, Samuel Insull and S. Z. Mitchell), stressed the importance of contextual factors:
The question arises, in conclusion, why Mitchell with a background in engineering and managing technology concentrated far more intently than Edison and to a greater extent than Insull earlier upon financial affairs….A major reason is that during the twenties when holding companies and men like Mitchell, who organised and directed them, flourished, technological problems were not critical—they were not tenacious obstacles to growth.

This would seem to suggest that the actions of the System Builder are heavily influenced by the context and the nature of the problems to be solved. This is why Edison was termed an ‘Inventor-Entrepreneur,’ Insull a ‘Manager-Entrepreneur’ and Mitchell a ‘Financier-Entrepreneur.’ The three men were all system builders but the nature of their role was dictated by the problem they were trying to solve. In fact, “Edison’s systematic approach ignored disciplinary boundaries: today we would say that he was problem, not discipline orientated” (Hughes, 1979, p.128). Edison could not separate technology from economics; his economic calculations were imperative to solving technological problems. This reinforces the notion of the ‘seamless web’ of the sociotechnical system; a blend of economic, technology and science (Hughes, 1979). However, at the core of the system builder concept is a commitment to invention, as Hughes (1979) states, “Edison was an engineer and a manager, the focus and the commitment for him remained invention.”

Coutard (1999) questions the relevancy of some of the assumptions and contexts in which the LTS theory was developed. This is echoed by Magnusson (2013) who suggests that the majority of studies within the LTS tradition have been in the context of public ownership and operation. This led to the publication of the ‘Splintering Urbanism’ (SU) thesis by Graham and Marvin (2001). The central proposition of the thesis is that the development and expansion of infrastructural networks in the century preceding the 1960’s was an inherent part of a ‘modern
infrastructural ideal.’ This rested on strong principles of centralisation and standardised services enforced through monopolistic practices. The collapse of this ideal has led to a transformation which has enabled a new infrastructural landscape to emerge. The ‘unbundling’ of infrastructural networks into divergent networks and services has led to the connection of powerful users together, ‘bypassing’ the ‘non-valued’ users/places. Graham and Marvin (2001) argue that ‘bypass’ strategies support the development of ‘premium networked spaces’ dominated by the elite in society which exclude those outside the network. This reinforces a ‘vicious cycle’ of the splintering of society in which people and places become disconnected. However, Coutard (2008) has written a fairly strong critique of the SU thesis, disputing the central proposition of Graham and Marvin (2001), i.e. the notion of the infrastructural ideal. He suggests that rather than collapsing, the ideal may not actually have been present at all, further citing a number of case studies of lower-income countries that, “…have long been splintered along ethnic or socio-economic lines” (Graham and Marvin, 2001, p. 1816). Coutard (2008) counters that the relationship between universal service provision and urban integration have historically been ambivalent, using the example of the standard connection of all residential units to essential networks as facilitating and supporting a strong policy of spatial segregation.

Given the criticisms levied at LTS, namely the strong tradition of public ownership and control of infrastructure, it has been argued that the ability of anyone to embody the System Builder role in modern times has diminished (Hawkey, 2014). The criticisms of LTS theory, including the tendency for strong public management and hierarchically controlled systems are acknowledged (Magnusson, 2013). In addition, Winskel (1998) has argued that system builders are attributed with too much authority. However, for the study of DH systems in the UK, several conditions make the theory highly relevant. The strong element of public involvement in the establishment of DH systems historically (Rytoft and
Strömberg, 2009). The clear role for the public sector in future system establishment (BRE et al, 2013), means that the tradition of strong public involvement in LTS theory is not wholly irrelevant. Haney and Pollitt (2013) support this position, writing of the continuing role of the public sector in energy matters, discussing public ownership, which encompasses traditional forms of public ownership and new forms of public ‘involvement.’ It is acknowledged that LTS theory does have a production bias, focusing as it does on the supply side and the System Builder; it is this very fact that makes it useful for considering the development of DH systems on a micro-level. It is also appreciated that whilst the theory was developed in a different economic and political time, the concepts and features remain highly relevant to DH systems today. Bolton (2010, p. 210) supports the assertion, stating that Hughes’ insights into the role of individuals in shaping early stage energy infrastructures “are relevant to the case of city-wide district heating schemes in the UK.”

LTS promotes a position which some argue portrays ‘heroic, male visionaries’ as the System Builders (Magnusson, 2013). However, Hughes (1979) in his work, ‘The Electrification of America: The System Builders,’ made many references to the network of individuals who support Edison: “supplemented and complemented by his laboratory staff and by the particular resources of Lowrey, Edison solved problems associated with technological change on various levels and in a systematic integrated way” (Hughes, 1979, p.132). Likewise, Samuel Insull relied strongly on a “superb statistics department that kept him informed of output, performance, costs and other variables in his business and technological system,” (Hughes, 1979, p.149).
5.4 Chapter Conclusions

Sociotechnical approaches to the study of technological development are useful in highlighting the fact that technologies do not just appear in isolation, as a result of science or of their own accord. Technology is shaped by many social groups, not just the system builder and is itself socially shaping. The sociotechnical perspective promotes an appreciation of the host of interrelated factors that influence the development of a DH system, emphasising the importance of contingency in accounts of technological change. This is useful in helping to balance action with context in studies of technological championing.

The actor-centric ethos of LTS with its proposition of a central system builder is highly relevant to the study of championing. The system builder and the champion share a number of similarities; both effectively solve a problem local to them, both rely on enrolling others into their cause and both must show an awareness of organisational/industry trends. Each must show a level of dedication and persistence above and beyond their official remit and act in a purposeful, strategic manner crossing many disciplines/organisational boundaries. The strong emphasis in the LTS literature on the problem solving nature of the system builder is useful for understanding the motivations of champions, which as appreciated by Markusson (2010) have been given limited empirical attention. In LTS theory, the system builders are motivated by the problems of the time, enabling a greater appreciation of contextual factors.

A number of parallels have thus been drawn between the two concepts. However, it is appreciated that the system builder concept was developed in a period that was characterised by strong state control of public infrastructure, and some have questioned the relevancy of the concept for modern infrastructures (Hawkey, 2014). However, as Van der Vleuten and Kaijser (2004) advise, ‘system builders’ can be conceptualised as organisations (companies, Governments) or even cooperation between several
organisations or groups of actors. This conceptual stretching of the notion enables the concept to be more widely applied.

This study presents a theoretical departure from recent conceptualisations of DH (Hawkey, 2009; Bolton, 2010) which have been predominantly grounded in innovation studies and economic theory. The studies, whilst useful in unearthing the meso-macro level issues influencing DH systems, have neglected to fully appreciate contextual development and the role of agency. By assuming a broadly macro-level approach, the intricacies of system building at the firm-level have been somewhat neglected. The following chapter examines the methodological approach adopted in pursuit of the research objectives.

5.4.1 The Analytical Framework

Following Markusson’s (2007) approach, an Analytical/Conceptual Framework has been developed from an interrogation of the literature, in pursuit of the research problem. The framework developed can be considered ‘conceptual’ as defined by Miles and Huberman (1994, p.18) as a written or narrative presentation which,

“explains either graphically, or in narrative form, the main things to be studied – the key factors, concepts or variables and the presumed relationship among them.”

However, the framework may also be considered ‘analytical’ in the sense that it will be used to generate explanations, adopting the approach of Markusson, debates surrounding the most appropriate term have been avoided and for consistency, the term ‘analytical’ framework will be employed throughout the thesis.
Figure 5.1 displays the analytical framework for which the research questions described in Chapter 1 will be answered. At the centre of the framework is the Champion who can be considered as existing on a continuum of action and structure, the notion of which was introduced in Chapter 2. At the structural end are those organisational features and conditions which constrain or enable the championing attempt, including organisational objectives, culture, the structure of management and the coordination or lack of inter-departmental cooperation, which gives rise to the ‘opportunity for championing.’ This reflects the central theme of the literature on the tension between the agency and free will of the individual and the relative important of his/her qualities and behaviours in championing change and the ‘opportunity for championing’ which may be determined by more structurally-related conditions including the organisational objectives and motives of the Local Authority. As the preceding chapters have shown the propensity to champion may be considered a function of both individual initiative, as well as more structurally-determined factors. The analytical framework avoids the pitfalls identified in Chapter 2 of over-estimating the dominance of the individual over his/her context or viewing the champion as simply an outcome of structurally-determined conditions. By considering the propensity to champion as motivated by both action-oriented factors, as well as structural aspects, a more balanced account of the championing endeavour may be generated. In addition, through utilisation of the LTS theory an appreciation of the reciprocal nature of technological development and the influence of the characteristics of technology, which are currently under-appreciated in the literature, may be developed.

The framework also displays the three theoretical bodies from which the thesis draws upon to answer the research questions (these are displayed around the perimeter of the framework with the themes that link each conceptual body together). The Large Technical Systems (LTS) theory provides a complementary framework for the Championing literature (the key points of integration are detailed in Figure 5.2), with both schools of thought promoting the notion of a powerful agent of change. In the
Championing literature this role is embodied by the ‘Champion,’ in the LTS literature, its counterpart is the ‘System Builder.’ As described in Section 4.3.3, the System Builder and the Champion share a number of conceptual similarities; characteristics of dedication and persistence, a problem-solving nature and actions shaped by context. The emphasis on contextual development and contingency in accounts of technological change make LTS an appropriate choice for an actor-centric study of district heating development. LTS promotes the idea that technology is at once socially shaped and socially shaping, thus supporting the view as promoted by the Championing literature on the capacity of ‘champion(s)’ to instigate technological/innovative change. This is a critical conceptual point which makes the LTS theory particularly relevant to the study as it engenders an appreciation of the reciprocal nature of technological development and as is under-appreciated in the literature, the impact of the characteristics of technology on the system building champion. By incorporating into analysis both structure, agency and technological characteristics, through an appreciation of the reciprocal nature of technological development, the framework offers a novel approach to the study of champions of district heating (itself an under-studied phenomenon). The insights drawn aim to provide a more balanced account of the championing of change.
Figure 5.1: Analytical Framework
Large Technical Systems (LTS)

- Actor centric-heroic ‘System Builder’
- Emphasis on contingency/contextual dev.
- Technology is socially shaping & socially shaped
- System Builder is a problem-solver; problems, dictated by time i.e. context.
- System Builder must counter ‘reverse salients’
- Personal qualities important: inventive hard work, dedicated.
- Exact role of System Builder changes according to stage of tech. dev
- ‘Environment:’ System Builder must bring aspects of environment under his control
- System Builder uses a host of tactics/tricks to enrol others into ‘shared purpose’

Championing Literature

- Actor centric-the ‘Champion’
- Structural accounts; ‘opportunity for championing’
- Tension between action & structures, characteristics of technology important.
- Emphasis on individual initiative; creative solutions to organisational problems
- Champion must overcome obstacles
- Qualities/behaviours v important; risk taking, enthusiasm, persistence.
- The role of the Champion may vary according to stage of innovation adoption.
- The champion needs to obtain control of necessary organisational resources
- Champion lobbies & manipulates and builds a coalition of support for innovation.

Figure 5.2: Integration of Theories
As described in Chapter 3, there are human and social capital features of championing that stimulate action, with both being viewed as resources for the champion of innovation. The tension between action-based accounts which emphasise the qualities and behaviours of individuals and more structurally-determined championing studies which focus on the organisational context, requires a conceptual framework which appreciates both dispositional and contextual influences. The notions of human and (organisational) social capital thus allow for an examination of the key characteristics and skills pertaining to the individual (the ‘why’ of champion origins), as well as the ‘how’ by operationalising the concept of (organisational) social capital as a way of understanding the process by which a champion instigates organisational change. The concepts of human capital and (organisational) social capital echo the dominant theme in the Championing literature of the importance of the both individual qualities & skills (Human Capital) and more structural aspects of the organisation (Organisational Social Capital). It also resonates with the themes of heroic System Builder in the LTS literature and the importance of contextual development in accounts of technological change. Drawing on the three conceptual bodies thus enables an integrated and complementary approach to the study of the origins of champions of district heating technology in the UK. The following chapter details the methodological approach developed in order to operationalise the framework.
CHAPTER 6: METHODOLOGY

6.1 Introduction

The following chapter explains the methodological approach adopted in pursuit of the research aims. The selected research strategy will be examined encompassing key design aspects including the unit of analysis, participant selection, and the specific research instruments. The issue of data bias and the quality (or rigor) of enquiry will also be addressed and the chosen research strategy will be compared to methodological approaches within the field.

6.2 Research Design

A Pragmatic Rationale

In light of the weaknesses of an extreme action or structural perspective, as detailed in Chapter 2, it was considered vital to adopt a research methodology that would enable a balanced and yet substantial assessment of DH championing. As such, a Pragmatic approach employing Mixed Methods was selected as this was deemed the methodology most capable of answering the research problem. As Tashakkori & Teddlie (2003) propose, a pragmatic approach centres on selecting the research methods that work in an effort to answer the research question. It also facilitates triangulation, as well as modes of analysis (Feilzer, 2010). Quantitative methods enabled the measurement and comparison of human and organisational (social) capital features and a qualitative strategy helped to dig beneath these findings, as supported by
Querstret and Robinson (2013). As Fielding (2012) neatly surmises, “Mixed Methods potentially offer depth of qualitative understanding with the reach of quantitative techniques.” Fielding (2010) goes on to succinctly reinforce the primary motivation for adopting a Mixed Methods approach, that of triangulation:

...no single method is likely to afford a comprehensive account of the phenomenon under investigation, thus two or more methods are employed to bring to bear different intellectual tools on the task at hand. The assumption is that different perspectives can be generated which will give a fuller and more informative picture of what is going on: such fuller pictures will be more rounded, nuanced and valid than than produced by a single method.

As such triangulation enables helps to strengthen and validate findings through the use of more than one method (methodological triangulation). By drawing on more than one theoretical knowledge base, theoretical triangulation is also employed. It is appreciated that the research approach adopted hinges on the researcher’s philosophical persuasion (which is underpinned by core beliefs about reality, knowledge and human nature). These attitudes fundamentally shape the methodological approach chosen and have important implications for the research strategy. As such, there are some who would argue against the mixing of methodologies that have distinct ideological viewpoints, where the concept of mixing different elements of the philosophical schools of thought is simply anathema (the ‘Embedded Methods’ argument). For many academics it simply isn’t possible to mix research methods, as these philosophical schools of thought have views of reality that simply cannot be reconciled. However, Bryman and Bell (2011) state that the mixed approach has increased in popularity since the 1980’s,
indeed Tashakkori & Teddlie (2010) suggest the Mixed Methods approach as having emerged from the triangulation of different data sources in the Sociology and Psychology fields. Curran and Blackburn (2001) in Collis and Hussey (2009) further support the argument for employing Mixed Methods approaches, stating that the pragmatic approach is an attempt to ‘cross the divide between the quantitative and the qualitative and the positivist and the non positivist’ thus offsetting the weaknesses of one paradigm with the strengths of another. Certainly, some believe that ‘Mixed Methods’ have evolved into a separate and distinct research movement in its own right. Tashakkori & Teddlie (2003) go as far as to propose Mixed Research Methods as the ‘Third Methodological Movement.’

Discussing the epistemological implications of Mixed Methods studies, Moran-Ellis et al (2006) reflect on pragmatism as an approach which conceptualises methods in a technical, rather than epistemological vein, considering the literature which suggests that in practice researchers involved in applied research pay little attention to paradigm differences, and as a consequence do not treat certain methods as the exclusive preserve of a particular epistemological persuasion.

The authors go on to discuss the many proposed benefits of adopting a more pragmatic, mixed methods approach including, increasing the accuracy of findings and the confidence in them, as well as the generation of new knowledge through a synthesis of the findings from different approaches. Fielding (2012, p.2) proposes that the most convincing argument for adopting a Mixed Methods approach is the potential it offers for ‘*sophisticated analytical conceptualisation:*’
the real quantitative/qualitative distinction is not between number and text but between understanding the world by a theory of variance featuring variables and correlations and understanding the world by a theory of process in terms of events and interactions. Put that way, it is clear that both are essential. Rather than mixing because there is something intrinsic or distinctive about quantitative data or qualitative data, we mix so as to integrate the two fundamental ways of thinking about social phenomena.

Moran-Ellis et al. (2006) discuss the roots and evolution of triangulation as a research methodology. The authors muse that whilst for some the idea of crossing the ‘paradigmatic divide,’ is impossible, they do appreciate that complex social phenomena are comprised of both interpretivist and positivist elements.

The authors further discuss how some employ triangulation as a way of understanding the social world from a theoretically-driven base, moving away from issues of ontological complexity to one which considers social phenomena as operating on different levels, in particular those of structure and agent. The use of multiple methods to generate appropriate types of data is therefore, essential for developing robust explanations of the social world.

Drawing on the insights from the literature examined, a pragmatic approach, employing methodological and theoretical triangulation is deemed appropriate to the nature of the study and consequently most capable of answering the research questions. The specific research instruments selected will now be examined.
6.2.1 Research Instruments

The actor-centric approach of both the Championing literature and the LTS body of knowledge (the key features of which are detailed in Figure 5.1) necessitate a methodology that enables an in-depth appreciation of the background, personality, value systems and career goals of the participants. In this vein, the particular research instruments deemed most capable of fulfilling the research aims were interviews (semi-structured), a self-completion survey and supporting documentation (this includes personal documents belonging to the Champions such as Curriculum Vitae (C.V’s), biographical information and project reports, as well as publicly available documents, case studies and academic studies. This allows for the elucidation of the kinds of rich data of a depth appropriate to an actor-centric line of enquiry. A brief overview of the strengths and limitations of each approach, relative to the field of study will now be detailed.

Surveys allow the researcher to gain information on practices, situations or views through the asking of defined questions. The two key forms of survey research are interviews and questionnaires. This approach is widely adopted in the field of (sociotechnical) DH investigation; interviews were reinforced with published material as in Russell (1986) and (1993), Hawkey (2009), Larsson (2006) and Bolton (2010) and Magnusson (2013). The championing literatures are strongly influenced by surveying methods. There is also an arguably growing feeling in Psychology literature that the two methodologies can be used creatively together (moving away from Trait theory alone) to help to decipher personality Querstret and Robinson (2013). The authors’ show how qualitative methods can be used to explore and explain certain quantitative findings, which in and of themselves may not provide an adequate explanation. It was therefore deemed appropriate to employ both survey
techniques (an interview and a self-completion questionnaire) for the purpose of this study.

The Research Schedule

During the literature review a number of key themes emerged that were used to develop the interview and survey questions, which were integral to answering the research questions. The questions for both the interview and the self-completion questionnaire (the full schedule for each are contained in Appendix C) were standardized. Table 6.1 details each major theme, as well as the sub or related theme. As appreciated by Markusson (2007), research is an iterative process and whilst themes can be standardized, new themes may emerge as the research is carried out. The themes were relatively stable during the study, although Entrepreneurial Tendencies through business creation arose as an emergent theme. The themes are essentially inter-linked and to some extent overlap; the Organisational theme for example, can be seen to be part of the Context theme, particularly Organisational Motives. The Motivational theme was deemed to be more of a sub-theme pertaining to both personality i.e. personal goals and context (referring to organizational objectives), as well external influences. For the Champion of Woking a specific theme also emerged, that of the Influence of Family/Background.
**Table 6.1: Interview Themes**

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-Theme</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personality</td>
<td>Motivation, personal objectives, values, motives for involvement.</td>
<td>Interview &amp; self-completion survey</td>
</tr>
<tr>
<td>Experience, expertise, knowledge.</td>
<td>Career path, education, knowledge/experience of DH, skills utilized.</td>
<td>Interview &amp; self-completion survey, as well as documentation.</td>
</tr>
<tr>
<td>Behavior</td>
<td>Actions, tactics, system strategies.</td>
<td>Interview &amp; self-completion survey</td>
</tr>
<tr>
<td>Organization</td>
<td>Public sector nature, cooperation, support, internal dynamics, status &amp; role of champion, challenges/obstacles to progress.</td>
<td>Interview &amp; self-completion survey, as well as documentation.</td>
</tr>
<tr>
<td>Context</td>
<td>Motivation for DH, initiating factors, organizational objectives.</td>
<td>Interview &amp; self-completion survey, as well as documentation.</td>
</tr>
</tbody>
</table>
The research schedule was structured into two major parts; the self-completion survey which included the Big Five Inventory (BFI), and an interview. The pitfalls of relying on a survey alone have been acknowledged, as appreciated by Markusson (2007). The research instrument which was used to cover each theme is also detailed in Table 6.1. Supporting documentation, both private, and publicly-available was also used to develop understanding, these included Local Authority reports, as well as C.V’s and biographical information.

For the self-completion survey, questions were developed that aimed to illicit a greater understanding of how each Champion perceived their role; how they themselves viewed the concept of a district heating ‘champion.’ In order to ascertain more about the motivations for involvement in initiating organizational change on a personal level, questions were designed to delve into the personal objectives of the participants which may have influenced their propensity to initiate change. Questions were also posed which aimed to understand more about the values of the champions and the extent to which these may have influenced their tendency to engage in championing district heating.

As the literature had indicated that the public sector environment may impose unique conditions for initiating change, questions such as, ‘How conscious were you in your role as District Heating champion of your duty as a public servant?’ were developed to investigate how the responsibilities of the public sector may have acted to constrain or possibly enable their actions. As the literature had also demonstrated that there may be limited inter-departmental cooperation within a Local Authority organization. Questions were posed that aimed to establish the extent of internal support and the degree to which the champion have acted alone or in a more collaborative fashion.

Questions within the self-completion survey were also designed to understand
more about the extent and nature of commitment to securing change. This would help to understand the level of personal risk that a participant is willing to endure in order to secure change. The participants were also asked whether they were recognized officially for their role in progressing the DH agenda, this was designed to establish the extent to which any reward or recognition may have acted as an incentive for action, a notion relatively under-explored in the literature.

The questions for the interview aimed to develop a rich and deep understanding of both the champion and the championing attempt. The research schedule focused on establishing a greater awareness of the context of each case and the motivation for DH. It was also deemed important to ascertain whether the participants had had any previous experience of DH.

In the case of the interview, the semi-structured style allowed the questions to be asked in a flexible open manner, allowing for rich and revealing digressions and elaborations on the part of the participant. The interviews were either conducted face-to-face or over the telephone. This was also the strategy in Summerton (1992), Larsson (2006) Hawkey (2009) and Bolton (2010). The structure of the questionnaire itself was given significant thought, appreciating as suggested by Boone and Boone (2012) the implications for data analysis of the type of scales that are employed in self-completion questions. Likert-type and likert-scale questions were used; the likert-scale questions were used for the personality/trait aspects of the questionnaire (where the answers from individual questions would be grouped to provide an overall score on a certain trait) and the likert-type scale was used for stand-alone questions (not summated).

A pertinent issue as experienced by Upham and Jones (2009), was the risk of
a self-completion survey being ignored; their study had an 11% response rate for their postal survey. This is commonly termed as ‘questionnaire fatigue’ (Collis and Hussey, 2009). This problem was acknowledged by Larsson (2006) who suggested his own research was limited by the availability, willingness to participate and accessibility of research participants. As such great efforts were taken to engage each research participant prior to gaining cooperation with the self-completion aspect of the study. It should also be noted that steps were taken to ensure the confidentiality of participants and the security of data in accordance with the guidelines of the University of South Wales. Efforts were made to store securely interview summary notes and questionnaire responses, as well as personal data and no information pertaining to data gained were distributed to any other persons in order to maintain the anonymity and privacy of study participants.

6.3 Data Analysis

Consideration was given to the most appropriate unit of analysis as discussed in Markusson (2007). The unit of analysis for the study is the individual (human capital characteristics), as well as the organization (organizational social capital and the ‘opportunity for championing’), thus enabling an appreciation of both action and structure in the consideration of the origins of district heating champions. The qualitative and quantitative aspects of the data necessitate distinct analytical efforts, the main challenges when attempting to analyse qualitative data is how to reduce and restructure the data in a form other than extended text, both in the analysis and when presenting the findings (Miles and Huberman, 1994).
6.3.1 Qualitative Methods

Following each interview the participant’s responses as well as the researcher’s notes, ‘memos’ (on emerging ideas) have been summarised and from the data, themes (codes) were drawn, in a progressive cyclical nature, clustering similar groups of codes together in order to categorise relevant issues. This led to the clustering of particular segments for subsequent cross-case comparison (as was the method in Larsson, 2006), thus strengthening the transferability of the findings. Likewise, Taylor et al. (2011, 2012) in their studies on environmental champions employed both ‘memoing’ and summary notes along with descriptive role-ordered matrices, semi structured interviews, content analysis and summary statistics from the questionnaire and the interview.

The organisation of key themes was aided by the construction of a conceptually-ordered matrix deemed most fitting to the nature of the study. The eventual creation of a meta-matrix, as suggested by Miles and Huberman (1994) was useful in ‘stacking’ the individual case- level data and dividing and clustering data, which itself was further refined to enable conclusions to be drawn. The conclusions were verified through the checking of notes, through consultation and review with participants and more widely through the seeking of a more balanced viewpoint from a range of stakeholders within the DH community. The act of employing methodological triangulation in itself, it is anticipated will strengthen the validity of results.
6.3.2 Quantitative Methods

Each participant was asked to complete a self-completion questionnaire, created online, which covered a number of key themes derived from the literature review (Appendix C). The 2nd part of the questionnaire consisted of questions designed to help build a profile of the champion’s personality characteristics (Appendix C). The Big Five (B5) Inventory (BFI) was utilised for this aspect, the inventory consists of 44 statements which participants are asked to rate on a scale of 1-5, 1: strongly disagree, 5: strongly agree (John and Srivastava, 1999). This measure was selected over other longer measures such as Costa and McCrae’s (1992) 240-item NEO Personality Inventory, Revised (NEO-PI-R), the 60-item NEO Five- Factor Inventory (NEO-FFI; Costa & McCrae, 1992), and Goldberg’s instrument comprised of 100 trait descriptive adjectives (TDA; Goldberg, 1992) (Gosling, 2003). As discussed by Gosling (2003) the 240-item inventory can be considered as too lengthy for some research purposes; hence the popularity of the shorter measures; the BFI has an estimated completion time of 5 minutes (John and Srivasta, 1999). Soto et al. (2008) notes, in adult samples the BFI scales have displayed a strong degree of internal consistency, a clear factor structure and retest reliability (as well as a strong convergence with longer B5 measures) (Benet-Martinez and John, 1998; John et al. 2010; John and Strivastava, 1999). There has also been considerable agreement between self and peer-reports (DeYoung, 2006; Rammstedt and John, 2007). Zillig et al. (2002) note that the various personality measures may vary according to the degree to which the creators of the measure consider personality as a function of affects, cognitions and behaviours. The Big Five or the Five Factor Model (FFM) suppose that most if not all, lower-level personality traits can be combined into five, all-inclusive, universal factors (Paunonen and Jackson, 1996, p.42). As McCrae and John (1998) write, FFM emerged from the lexical tradition (studies of natural
language trait terms), whilst the Big Five originated from the questionnaire tradition. Researchers in both traditions have independently worked on identifying generally the same 5 factors. Discussing Allport, John and Srivastava (1999, p.131) state:

_There are five replicable, broad dimensions of personality and they may be summarized by the broad concepts of Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experience._

As can be seen, researchers have emphasised different aspects of each trait:

**Agreeableness:** Trust (forgiving), Straightforwardness (not demanding) Altruism (warm) Compliance (not stubborn, modesty, tender-mindedness, eager to help others, compassionate (Costa and McCrae, 1992); altruistic- empathetic, kind, cooperative, trusting and gentle, complaint, modest (Bono and Judge, 2004);

**Openness:** values (unconventional) (Costa and McCrae, 1992); ‘intellect’ (Ozer and Benet- Martínez, 2006; Barrick and Mount, 1991) originality, imagination and intelligent (John, 1990; Barrick et al. 2003); inquiring intellect, Costa and McCrae (1992); unconventional ideas, strong need for change, highly capable of understanding and adapting to the perspectives of others, (McCrae, 1990);

**Conscientiousness:** (achievement, thorough, competence (efficient) strong willed (Costa and McCrae, 1992); control and constraint (John, 1990); persevere in their endeavours (Nadkarni and Herrmann, 2010; Judge et al., 2002; Barrick and Mount, 1991).
**Extraversion:** (gregarious), assertive, enthusiastic, warmth (outgoing) excitement seeking (adventurous) (Costa and McCrae, 1992); outgoing, gregarious, optimistic and upbeat (Weiten, 2010; Barrick et al. 2003);

**Neuroticism:** Emotional stability (Guilford, 1975); Remain calm, (McCrae and Costa, 1997), anxiety, depression, irritable, shy, moody, vulnerable, tense (Costa and McCrae, 1992);

Although there are differences in the conceptualisation of each B5 trait across the different measures, it is important to acknowledge that, “...despite differences in emphasis and interpretation . . . there is agreement among all these investigators that they are addressing the same phenomenon” (Costa & McCrae, 1992a, p. 653).

The software, Statistical Package for the Social Sciences (SPSS) was utilised for statistical analysis purposes, this enabled sophisticated analysis of the data including, computation of scale scores, the generation of descriptive statistics and the calculation of internal reliability indicators; Cronbach’s Alpha (α) and the Mean Inter-Item Correlations.

**6.4 Participant Selection**

Acknowledging the valid points presented by Howell and Higgins (1990) on the significance of identifying the Champion in a reliable way, careful identification and confirmation of the research target was undertaken. The judgement sampling method (as classified by Marshall 1996) involved three
concurrent activities aimed at ensuring the participant was indeed the Champion and did not adopt a different role in the process. Well-respected industry bodies which had compiled numerous case studies and contacts were thoroughly researched to compile a list of potential candidates for the championing role, separate internet searching to confirm the candidate’s involvement with the scheme was performed, thirdly contact was made with key independent stakeholders in the DH community and they were asked if there was a champion present in each DH system known to them. The list of potential champions was further populated through use of Edinburgh University’s Heat and the City Vanguard web site as well as personal correspondence with the project Fellow. This enabled a list of potential target Local Authorities to be assembled. Each potential target was contacted either by telephone or email, the purpose of the research was stated and the participants were asked to confirm the presence of a Champion for their respective DH endeavour. In some cases this led to a referral to another colleague within the LA or in cases where the Champion has since left Council employment, the person would contact the Champion on my behalf to establish if they were willing to participate in the research. In some cases, particularly with the high profile DH schemes, the Champions of each system are particularly well-known within the industry and direct contact was made with these participants. In addition, to ensure proper identification of roles, participants were asked to identify the nature of the roles played by others in the system building process relative to their own. In one LA, two separate drives for DH was discovered, within two different departments and both Champions were included. Both higher-level Champions as well as Officer-level Champions have been included and identified accordingly. As appreciated by Howell and Boies (2004, p.129) the role of a higher level (senior) management champion can be considered as significant given that innovation adoption ‘is typically voluntary at that level.’ A complete list of the 17 participants who responded
and agreed to participate can be found in Appendix A, although all 17 completed the semi-structured interview (completed over the telephone or by email). 2 champions (champion 3 and champion 17) failed to complete the self-completion survey, despite the best efforts of the researcher. One of the participants who failed to complete the self-completion survey is the Council Chief Executive who has considerable demands on in his time. The other champion stressed a substantial work-load. In light of the particular context of the champion i.e. district heating innovation, the figure of 17 champions was not considered significantly low given that DH has a relatively weak technological presence in the UK (although uptake is increasing). Furthermore, as discussed by Howell et al. (2005, p.658), organisational champions themselves are a ‘relatively rare organisational phenomenon’ (Howell and Higgins, 1990; Shane, 1994) in Howell and Higgins, 2005). Indeed, the number of champion participants varies within the championing literature from 6 case studies of 6 champions (Taylor et al., (2012); 10 organisational champions (Heng et al. 1999); 15 champions of sustainable investment (Lewis and Juravle, 2010); 19 pairs of champions and non champions (Howell and Boies, 2004) and 22 champions (Andersson and Bateman, 2010). Although, it is appreciated as purported by Taylor et al. (2011) that smaller sample sizes may limit the extent to which one can draw significant statistical analysis. For these reasons, where appropriate and relevant in this study, the use of summary statistics will be utilised as suggested by Taylor et al. (2011).

It is also purported that in order to gain a balanced perspective (and reduce the potential for selection bias) more than one stakeholder should be approached per scheme. As such interviews were also conducted where possible with Energy Service Companies (ESCo) contacts relevant to the major schemes surveyed as well as the Project Champion. Key actors in the DH community were also useful in shaping the research; interviews took place with public and
private sector experts in the field of DH. Interviews were also conducted with the Engineer instrumental in developing an early DH system in South Wales during the 1960’s as well a subscriber (customer) of the historic system. This provided an interesting insight into the realities of early DH scheme and how current perceptions may be shaped by poor early experience. Indeed Summerton (1992) interviewed a range of key actors in her study in order to gain a broad perspective. Larsson (2006) also drew on a wide range of interview targets, from the public and private sector in order to gain a broad perspective. The list of study participants can be found in Appendices A and B.

6.5 Reducing Bias

There is, it is acknowledged great opportunity for bias in selecting and interpreting data (Dey 1993), it is therefore vital that a researcher does not force their own preconceptions onto the data in order to fit a predefined view. Dey (1993) acknowledges that the danger lies not in having assumptions but rather in failing to be aware of them. As Dey (1993) proposes qualitative researchers should attempt to suspend beliefs in familiar convictions and examine evidence in new and critical ways. The key point is one should employ existing theory thoughtfully whilst at all times maintaining an open mind. As Summerton (1992) suggests an evolving critical attitude to one’s own (as well as others’) interpretation of reality is vital. One should avoid preconceived ideas that could blind a researcher to the evidence of the data (Dey, 1993). Efforts have been made, as far as possible to continually make efforts to remain neutral in supposition, refraining from leading participants through prose or body language during the survey stage and resisting any attempts to steer the interviewee to the will of the interviewer. The findings will be supported throughout by the use of participant quotes, to reinforce the trustworthiness of
findings (Pollitt and Beck, 2012 and Sandelowski, 1995). Although, as appreciated by Lincoln and Guba, (1985) and Pollitt and Beck, (2012) the inclusion of participant quotes needs to be done in a thoughtful and careful way.

A particular issue for self-completion surveys is acquiescence bias. This is refers to the tendency of individuals to agree with questions posed to them (Hofstee et al. 1998) or as described by Soto et al. (2008) disagree (regardless of content). Hofstee et al. (1998) stress the importance of appreciating the distinction between acquiescence, socially desirable responding and common content responding. However, in distinguishing between the phenomena, the authors clearly point out that opposite items tend to have opposite associated social desirability, thus endorsement of both items cannot occur as a result of socially desirable responding or content responding (which are both intimately linked). Danner et al. (2012) stress the importance of accounting and controlling for acquiescence bias in psychometric testing, stating that the bias can have state and trait-like dimensions. The very act of reverse scoring items is purported to help alleviate the problems associated with acquiescence bias, although the effectiveness of this has been called into question (Schriesheim and Hill, 1981). As suggested by John et al. (2008) and Soto et al. (2008) one can attempt to measure and correct for the acquiescence bias. In order to measure the bias a calculation of within-person response means (acquiescence scores) was computed from 16 pairs of BFI items (these items have opposite implications for personality, such as “Is talkative” vs “Is quiet”) (Soto et al. 2008, p.723). The mean responses (across all items) are subtracted from each participant’s individual item response, then dividing by the standard deviation of that participant’s response (Soto et al., 2008, John et al. 2008).

As Soto et al. (2008, p.723) states, ‘The resulting set of transformed responses has a mean of 0 and a standard deviation of 1 for each participant.’ Although, as appreciated by Rammstedt et al. (2010) individual differences in profile
shape remain. As advised by Rammstedt et al. (2010) the responses to these items should be symmetrical about the scale’s middle category if an individual is answering consistently to the two items. By contrast acquiescence should result in a mean rating of greater than 3 (as a 1-5 likert scale is used). A score greater than 3 would seem to suggest that agreement with the positive item is stronger than rejection of its negative counterpart. Likewise, a score of lower than 3 would seem to suggest that rejection of the negative item is stronger than agreement with the positive ‘nay saying’ (John et al. (1999) Extreme response bias also needs to be considered, extreme responding as defined by Greenleaf (1992) is the tendency of participants to choose an extreme response regardless of content. Soto et al. (2008) and John et al. (2010) advise those seeking to establish the extreme response scores of their BFI study to calculate the standard deviation of their 32 item responses. Following this guidance, the Acquiescence Index (AI) and the response extremeness scores have been calculated to consider the potential effects of a tendency to agree/disagree as well as score in an extreme manner.

**Internal Reliability**

Cronbach-alpha coefficients, ‘coefficient alpha’ ($\alpha$) were calculated in order to provide an idea of the internal consistency of the composite scores.
<table>
<thead>
<tr>
<th>B5 Factor</th>
<th>$\alpha$</th>
<th>Inter-Item Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreeableness</td>
<td>0.51</td>
<td>0.18</td>
</tr>
<tr>
<td>Consciousness</td>
<td>0.78</td>
<td>0.31</td>
</tr>
<tr>
<td>Openness</td>
<td>0.74</td>
<td>0.22</td>
</tr>
<tr>
<td>Extraversion</td>
<td>0.89</td>
<td>0.51</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>0.85</td>
<td>0.41</td>
</tr>
</tbody>
</table>
As can be seen from Table 6.2, all B5 factors produced relatively strong coefficient alphas, apart from the Agreeableness factor ($\alpha=0.51$), its mean inter-item correlation is also relatively low (0.18). There is a lack of consensus on acceptable levels of reliability (Clark and Watson, 1995), Nunally (1978) is frequently cited as stating a level of $\alpha=0.70$ and above as generally acceptable, although he did in fact recommend minimum standards of $\alpha=0.80$ and $\alpha=0.90$ for basic and applied research respectively. However, as appreciated by Clark and Watson (1995) many contemporary researchers declare $\alpha$ in the range of 0.60-0.70 as sufficient (as discussed by Clark and Watson, 1995). Soto et al. (2008) suggest the use of the mean inter item correlation (the average correlation of the items on the scale) as a more suitable measure of internal consistency, as it is unaffected by differences in scale lengths (and hence enables comparisons across the BFI scales). As such Table 6.1 also displays the mean inter item correlation for each of the B5 domains. Indeed, Clark and Watson (1995, p.14) further support this assertion, discussing the fact that $\alpha$ is essentially a function of the extent of inter-correlation between items or the number of items in a questionnaire; an estimate of internal reliability can be inflated through an increase in participants:

.....the average inter item correlation (which is a straightforward measure of internal consistency) is a much more useful index than coefficient alpha per se (which is not), test developers should work toward a target mean inter-item correlation rather than try to achieve a particular level of alpha.

The authors suggest that the average inter item correlation should be in the range of 0.15-0.50 (Briggs and Cheek, 1986 in Clark and Watson, 1995), for a higher order construct such as the B5 domain of extraversion a mean correlation of 0.15-0.20 is desirable. Considering the mean inter-item
correlations detailed in Table 6.1, it can be seen that the mean ranges from 0.18-0.51; Extraversion has the highest level of inter item correlation (0.51). However, Clark and Watson (1995) argue that focusing on the mean inter-item correlation is not a sufficient measure of ‘unidimensionality’ (when the scale items measure a single underlying factor/construct). The authors argue that consideration should be had of the range and distribution of the individual inter item correlations. Cortina’s (1993) study showed that an acceptable mean inter item correlation can be established by averaging many high coefficients with many low ones. Furthermore, it is suggested that to ensure unidimensionality, the majority of the (individual) inter item correlations should be moderate in magnitude, clustering narrowly around the mean (Clark and Watson, 1995). Clark and Watson (1995) suggest that the individual inter item correlations should range between 0.15-0.50. Examining the Agreeableness factor in greater detail, Table 6.3 displays the item statistics, the 9 item-scale contains four reverse coded items [bfi2r, bfi12r, bfi27r bfi37r]).
Table 6.3: Agreeableness scale: item total statistics

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Corrected Item Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>bfi2r(Cold)</td>
<td>3.8667</td>
<td>.51640</td>
<td>.503</td>
</tr>
<tr>
<td>Helpful</td>
<td>4.2000</td>
<td>.56061</td>
<td>.269</td>
</tr>
<tr>
<td>bfi12r</td>
<td>4.2667</td>
<td>.79881</td>
<td>-318</td>
</tr>
<tr>
<td>Forgive</td>
<td>4.0000</td>
<td>.53452</td>
<td>.826</td>
</tr>
<tr>
<td>Trusting</td>
<td>4.2000</td>
<td>.56061</td>
<td>.269</td>
</tr>
<tr>
<td>bfi27r</td>
<td>4.0667</td>
<td>1.09978</td>
<td>.051</td>
</tr>
<tr>
<td>Considerate</td>
<td>3.9333</td>
<td>.59362</td>
<td>.485</td>
</tr>
<tr>
<td>bfi37r</td>
<td>3.8000</td>
<td>1.20712</td>
<td>.164</td>
</tr>
<tr>
<td>Cooperate</td>
<td>4.5333</td>
<td>.51640</td>
<td>.577</td>
</tr>
</tbody>
</table>
Examining the ‘Corrected Item Total Correlation’ which is the extent to which the item correlates with the total score it can be seen that for the three reverse coded items, bfi12r, bfi27r and bri37r, there is low and even negative correlation (bfi12r). Although, bfi37r is arguably borderline ‘acceptable’ these three factors also have the highest S.D’s of 0.80, 1.10 and 1.21 respectively. Following an examination of the inter-item correlation matrix (not displayed), it was found that these three offending items (bfi2r, bfi27r, bfi35r) were negatively correlated with a number of other items in the scale.

Gurven et al. (2013) suggests that reliability problems with reverse-scored items could be because of ‘socially desirable responding’ or possibly because of acquiescence bias. In considering the reliability scores for the data in this sample, one can compare the findings of other studies. As Soto et al. (2008) notes, in adult samples the BFI scales have displayed a strong degree of internal consistency, clear factor structure and retest reliability (as well as a strong convergence with longer B5 measures) (Benet-Martinez and John, 1998; John et al. 2010; John and Strivastava, 1999), as well as a considerable agreement between self and peer-reports (DeYoung, 2006; Rammstedt and John, 2007).

The (content-balanced) acquiescence index (AI) for their 32 item responses are displayed in Table 6.4. As can be seen on the whole, the within-person response means cluster around the middle score category (3). As Rammstedt et al. (2013) note if acquiescence bias is present one would expect a score greater than 3 to indicate a tendency to agree (or conversely below 3 to indicate a tendency to disagree), with two scores marginally lower than 3 (2.88 for champion 6 and 2.84 for champion 5). The participant’s extreme scores for the 32 content-balanced item responses are detailed in Table 6.4. As can be seen the AI mean score is most accurate or representative for Champions 6, 12 and
15 who have the lowest extremeness score. By contrast the largest score for extremeness was noted for Champion 5, although the score is still relatively low. On the whole it would seem that acquiescence and extremeness bias does not appear to be a significant issue for the group, (in keeping with existing findings in the literature which suggest that acquiescent bias for participants of a high standard of education should be low (Meisenberg and Williams, 2008; Rammstedt et al. 2013). More generally, McCrae et al. (2010, p.4) advise caution against the declaration of ‘good’ or ‘bad’ internal reliability scores, suggesting that a range of factors can influence internal reliability including ‘item content heterogeneity,’ which centers on whether an item covers many traits or relatively few; the greater number of aspects of a trait covered the lower the internal consistency. Certainly, as discussed by Zyllig et al. (2002) Agreeableness is second only to Extraversion in terms of the breadth of the construct which may provide some explanation as to lack of internal consistency.
Table 6.4: Acquiescence and response extremeness scores

<table>
<thead>
<tr>
<th>Champion</th>
<th>Response acquiescence index</th>
<th>Response extremeness score</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>3.13</td>
<td>1.04</td>
</tr>
<tr>
<td>4</td>
<td>3.00</td>
<td>1.28</td>
</tr>
<tr>
<td>5</td>
<td>2.84</td>
<td>1.53</td>
</tr>
<tr>
<td>13</td>
<td>3.06</td>
<td>1.27</td>
</tr>
<tr>
<td>8</td>
<td>3.03</td>
<td>1.52</td>
</tr>
<tr>
<td>14</td>
<td>3.09</td>
<td>1.51</td>
</tr>
<tr>
<td>2</td>
<td>3.25</td>
<td>1.43</td>
</tr>
<tr>
<td>10</td>
<td>3.28</td>
<td>1.50</td>
</tr>
<tr>
<td>7</td>
<td>3.19</td>
<td>1.63</td>
</tr>
</tbody>
</table>
6.6 Chapter Conclusions

An outline has been given of the philosophical persuasion underpinning the methodology and the research approach adopted, this has been contextualised with the methodological approaches within the field. The mixed methods approach is deemed relevant and useful for achieving the research objectives, enabling the utilisation of a validated measure of personality which is supported by qualitative findings. Indeed, the qualitative approach will be imperative to establishing depth and richness of data vital for investigating the contextual complexities of championing. The participant selection process has been detailed, as well as the specific research instruments and the key issues inherent to each. Analytical techniques employed have also been explained. Of critical importance to the research is reducing the potential for bias as far as possible, as well as maintaining the quality of the research. Two key ways in which this has been achieved in conjunction with the validated personality measure, the BFI, has been the calculation of internal reliability indicators (Cronbach alpha coefficients and inter-item correlations). In addition, consideration has been given to the potential for acquiescent or extreme response scoring.

As noted by Summerton (1992) when discussing the pitfalls of a through the lens of the system-builder approach, memories fade and are selective, conflicts may be hidden and people may have a vested interest in projecting a certain image either of themselves or of the project. Likewise, Howell and Boies (2004) discuss Nisbett and Wilson’s (1977) concern on the ability to recall historic championing events. However, as DH represented a major technological change, the situation can be considered as highly salient and so recall should offer a good reflection of actual events. Through adoption of a
Mixed Methods approach, one hopes to strengthen the overall research findings through the process of triangulation. The notion of ‘Mixed Methods’ is contentious for some, however, as appreciated by Collis and Hussey (2009), a pragmatic approach, choosing the methods most beneficial to achieving the research objective.
CHAPTER 7: THE LOCAL AUTHORITY ORGANISATIONAL CONTEXT

7.1 Introduction

This chapter uncovers the ‘why’ of champion origins through an examination of the organizational context of the DH champion and how the ‘opportunity for championing’ arises. Central to this is investigating the organizational motivation for DH and the extent to which the champion emerges, or is formally appointed. The ‘how’ of champion origins is also revealed; the creation of organizational social capital is shown to be pivotal to championing attempts. The ways in which the champion creates the vital forms of structural, relational and cognitive social capital will be revealed.

7.2 The Opportunity for Championing

The following section examines the LA motivation for DH, in each case considering the drivers and enablers for DH and how these factors came to shape the ‘opportunity for championing.’ The extent to which DH was pursued as a result of the initiative of the champion or as part of broader organisational drive for DH will be discussed. Table 7.1 summarises the opportunity for championing district heating in each LA as a function of the organizational agenda, LA drivers and the individual initiative of the champion (whether they emerged more informally or were appointed to the role). Each case is then addressed more fully in turn.
Table 7.1: The opportunity for championing

<table>
<thead>
<tr>
<th>Council</th>
<th>Organisational Agenda</th>
<th>Drivers</th>
<th>Emergent or appointed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aberdeen</td>
<td>Fuel Poverty/Affordable Warmth</td>
<td>Home Energy Conservation Act (HECA)</td>
<td>Emergent</td>
</tr>
<tr>
<td>Lerwick</td>
<td>Economic prosperity of Island</td>
<td>Landfill tax directive</td>
<td>Appointed</td>
</tr>
<tr>
<td></td>
<td>Energy security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leeds</td>
<td>Fuel Poverty</td>
<td>DECC Low Carbon Pioneer Cities Programme</td>
<td>Emergent</td>
</tr>
<tr>
<td></td>
<td>Carbon dioxide reduction</td>
<td>Strategic Heat Programme</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low carbon heat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southampton</td>
<td>Energy security</td>
<td>Oil crisis, 1970s</td>
<td>Appointed</td>
</tr>
<tr>
<td></td>
<td>Long-term energy sustainability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheffield</td>
<td>Fuel Poverty</td>
<td>Fuel Poverty</td>
<td>Emergent</td>
</tr>
<tr>
<td>Renfrewshire</td>
<td>Alleviating FP</td>
<td>Scottish Housing Quality Standard (SHQS)</td>
<td>Appointed</td>
</tr>
<tr>
<td></td>
<td>Carbon savings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Strategy/Plan</td>
<td></td>
<td></td>
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<tr>
<td>-------------</td>
<td>---------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barnsley</td>
<td>Increase renewable energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fuel Poverty Strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upgrading existing heating systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biomass utilisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Efficiency improvements</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(coal use reduction)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Biomass Implementation Strategy</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Emergent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swindon</td>
<td>Sustainable energy systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Swindon Sustainable Energy Framework (SSEF)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Development of Local Plan</td>
<td></td>
<td></td>
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For Aberdeen City Council (ACC), DH was appraised amongst other options as a solution to the considerable problem of Fuel Poverty amongst the Council’s tenants (Champion 9). Champion 9 played a significant lobbying role in her position and drove the agenda for action:

_Having written the Council's Fuel Poverty Strategy and used this to get the Council to adopt an Affordable Warmth Strategy for the city, it was clear that multi-storey blocks were the build type with the highest level of fuel poverty amongst its occupants._

Following a housing stock assessment it was found that significant upgrades were required to the properties, most of which were multi-storey buildings heated electrically. The Council was obligated through the Home Energy Conservation Act (1995) to make improvements to its residential properties in terms of energy efficiency and carbon reduction. At the time, favourable Government support for DH, a £50 million UK-wide capital programme for installing and refurbishing district heating, called the Community Energy Programme, led the Council to explore the potential of heating its high-rise housing stock via a DH system. Champion 9 played a pivotal role in the consideration of DH: “_I got CHP district heating included as one of the options in this appraisal as I reckoned it might be a good way forward._”

The LA was under the dual pressure of providing cost-effective heating for its tenants whilst at the same time reducing its environmental burden and improving its housing stock. District heating offered a way of tackling both
issues. The driving force for the scheme was the pressing need to provide affordable heating to the Council’s housing tenants, the majority of which were classed as vulnerable. The nature of this scheme can thus be considered a community project with the primary aim of easing a significant social problem, whilst also delivering significant carbon savings. This objective would ultimately shape all subsequent decisions involved in developing the DH system. Champion 9 discusses the positive knock-on effects of the Affordable Warmth Strategy: “The Affordable Warmth Strategy would bring positive economic benefits long-term; the lower fuel bills mean that tenants will stay longer, possess lower levels of rent debt and as a result the demand for properties would increase.” Having considered a range of possibilities, DH was seen as the most viable option. As champion 9 herself states, DH represented, “...a technical solution for a social problem.” DH was viewed as a solution to the significant organisational problem of FP in the Council’s housing stock. However, it was
Champion 9 who proposed DH as a possible option and believed it to be a potentially worthwhile solution. The pressing need to address FP in Council housing stock, driven by the HECA, coupled with the suggestion of champion 9 to consider DH, helped to shape the opportunity for championing DH in Aberdeen. DH effectively became an organisational issue when champion 9 enthusiastically promoted it as so.

**Birmingham**

Interestingly, the motivation for the DH system in Birmingham originally came from a Council employee other than the champion. An Engineer who had originally been involved with the development of the International Convention Centre (ICC) in Birmingham had the idea of utilising the centre as a key anchor load for the introduction of a DHN (Champion 11). In collaboration with the local higher education institute, Aston University, steps were made to initiate a feasibility study to assess the potential of the idea. A desk-top study compiled in-house in 2006 by the Urban Design team of the Planning Department, was followed by an official study (Champion 11). Two key areas were identified as potentially suitable for a DH network; the Broad Street and the East Side itself incorporating Aston University. A cluster of buildings provided the catalyst for a burgeoning DH scheme, incorporating gas-fired CHP. Visits were made to two UK-based District Heating Schemes, Southampton and Sheffield, in order to further develop the project brief. Around this time Champion 11 took over the role of Energy Manager and was effectively tasked with making the DH scheme a reality: “I loved the concept and idea and ran with it!” (Champion
11). The project is driven by its Climate Change Strategy and Action Plan which aimed to reduce CO2 emissions by 60% by 2025. However, employee initiative played a strong role in shaping the championing opportunity in Birmingham. Interestingly, an employee other than the champion strongly championed the DH agenda within the Council and played a pivotal role in the proposal of DH. In spite of the formal appointment of Champion 11 significant effort was needed in order to build widespread organisational support, particularly amongst the political members who champion 11 states, “call the shots.”

Lerwick

In 1992, Shetland Island Council (SIC) was considering its options for its ageing incinerators which were due to be decommissioned in 1996. Driven by the burdensome Landfill Tax obligations, the Council commissioned a report exploring options for its waste problem (Champion 1). Numerous options were explored, one of which was the development of an Energy from Waste (EfW) facility with a DH network. At the time, DH was a relatively unfamiliar concept with Councillors asking, “What is district heating?” (Champion 1). The Environmental Department, as the initiators of the study, then contacted an energy company as a possible supplier of heat they agreed to jointly fund a study trip to Denmark and commissioned a feasibility report, examining the idea in greater detail. Champion 1, who at the time held the position of Water and Drainage Engineer, was asked to accompany the Environment Officer and the energy company representative, stating, “I was asked to go with an Environment officer and the energy company man as engineering backup as I had probably laid
more pipes and pumping stations than anyone else in Shetland.”

The report was published in 1993 and recommended that a scheme in Lerwick was viable, suggesting that the starting phase could be centred on the power station. In spite of these recommendations the plans were left untouched for 4 years by which time the Council’s project partner, the energy company, had pulled out. The LA, however, took the decision to progress with the EfW plant and the Shetland Island Charitable Trust came on board as a significant investor. The Trust was founded with the aim of delivering investments of direct benefit to the people and economy of the Islands (Champion 1). During the 1970s the discovery of North Sea oil meant that oil was pumped to Shetland for onward transportation. By way of compensation for the disturbance generated, oil companies in the area provided compensation to the Council. The Energy from Waste (EfW) facility with a DH network was deemed a suitable investment, helping to reduce heating bills whilst at the same time dealing with the island’s waste problems. As the island has no gas mains connection, DH did not have to compete with an incumbent gas system. The project goal was clear; the scheme would be introduced for the economic benefit of the Shetland Island, generating local growth and employment opportunities, and developing a sustainable system for future energy needs (Champion 1).

Further study visits were undertaken to Denmark for design advice and to a UK scheme to obtain an understanding of a UK-based DH project. Champion 1 stressed the importance of visiting a UK scheme first rather than going straight abroad as the training can be ‘very intensive.’ Having gained inspiration in the Danish systems, the Danish consultants COWI were
commissioned to construct the Lerwick scheme as well as develop further feasibility studies for expansion plans. Champion 1 viewed the use of Danish experts as a way of guarding against the perceived risk of a lack of suitable domestic expertise.

Up until this point Champion 1 had been informally appointed to assist the investigation into the feasibility of DH. His official position with the Department of Design and Technical Services was soon to be transferred to the North of Scotland Water Authority following an administrative reorganisation. This led to great uncertainty over his future position: “For over a year I ended up in limbo (called a displaced person along with many others) even running the schools capital budget….but then the district heating side took off” (Champion 1). Following approval for the DH project, Champion 1 was officially interviewed and secured the role of Manager of Shetland Heat Energy and Power, the ESCo established to operate the system.

The factors that helped to shape the opportunity for championing DH in Lerwick are quite unique. The LA was driven by the need to address its waste problem and consequently reduce its Landfill Tax burden. At the same time the lack of mains gas on the Island meant that long-term energy security was a pressing issue. The Council also had the support of a considerable financial investor in the form of the Shetland Charitable Trust which meant that there were no concerns about financing the initiative. The organisational agenda for DH was very strong in Lerwick although, as was the case with Champion 11 in Birmingham, this does not mean that there wasn’t any opposition to the proposal. Indeed, much effort was required to
bring on board both public sector stakeholders and prospective customers (champion 1).

**Southampton**

The oil crisis of the 1970s led the then Department of Energy (DOE) to undertake an exploration for alternative sources of energy. This led to the search for geothermal heat with four drilling wells created around the country, one of which was in Southampton (Participant B). A parallel can be drawn with Summerton (1992) in what she termed the ‘spirit of the times’ with an emphasis on energy conservation aimed at reducing oil consumption leading many to turn to DH as a viable alternative. By the end of the 1970s, however, the oil crisis was over and with it the Government’s support for the idea of geothermal energy with many bore holes deemed ‘un-exploitable.’ The discovery of North Sea oil and gas had provided the Government with a timely answer to the energy dilemma and alternative sources, such as the geothermal well at Southampton, were formally abandoned. At the time the City Architect was leading on the project but due to ill health was forced to retire. Champion 17 explains his serendipitous route to championing:

*It was pure serendipity that I became the project leader. I was then Asst. City Treasurer and was keeping a watch on the schemes finances. The City Architect was originally assigned to the project but after a few months he was taken seriously ill and retired. As I was the only other senior officer who knew anything about it, I was asked to take on the project leadership and I was allowed to select my own team.*
Champion 17 and his specially selected team, however, were undeterred and continued to pursue the idea of a geothermal DH scheme. A study trip was made to Paris to further develop the project scope and to enable the system builders to see for themselves a working geothermal system. This enabled a greater understanding of the potential for geothermal energy in Southampton. Champion 17 attributes much of the success of the DH initiative to his talented and passionate team:

*It was the skills and enthusiasm of the Southampton team that was largely responsible for the project’s success. My colleague, the Asst. City Secretary, was superb and drafted the legal agreements in a non-adversarial manner, that Co-operation Agreement has underpinned all our early work and encapsulated precisely what we needed to achieve.*

The opportunity for championing arose partly due to wider shocks in the energy market; the oil crises led to the search for alternative sources of energy on a national scale. However, it was the enthusiasm and commitment of the champion and his LA colleagues (Participant B) that ensured the potential for DH and geothermal energy, was not lost in Southampton.

*Sheffield*

The original goal of the system which was installed in 1988 was to deliver affordable heat to lower socio-economic housing and civic buildings: “*The concept of Fuel Poverty had not been coined at the time of the Sheffield*
District Heating scheme was created, however its impacts were very much the driving force for the project” (Participant 11). Following the oil crisis of the 1970s the issue of a sustainable energy supply was firmly on the agenda.

A consortium, ‘Sheffield CHP Consortium,’ was established consisting of those key actors who were interesting in developing a DHN in the city. These included the Council, the University of Sheffield and Sheffield Polytechnic (Participant 11). The project aimed to utilise the heat generated from an EfW facility and pipe it to social housing tenants in the city. DH thus provided a solution to a social problem, as well as environmental benefits.

The scheme was approved and Sheffield Council incurred considerable financial risk in establishing ‘Sheffield Heat and Power’ on a joint venture basis with a Finnish contractor. Unfortunately, this left the LA with a large capital debt that it could not service which meant that when calls were made in 2001 for improvements to its EfW facility, the Council did not have sufficient funds available (Participant 11). At the time, the Council was under considerable pressure from environmental groups and members of the local community to upgrade the facility to acceptable standards. The negative externality of pollution and public health worries presented a reverse salient which at the time limited the continued operational capabilities. As Kaijser (2004) previously expressed, environmental and health problems are rarely conceptualised as reverse salients as they have not posed pressing hindrances to future expansion. In this case, however, so immediate was the threat that the original EfW facility was closed down. Shortly after this Champion 14 joined the LA as the Head of Environmental Strategy and was
integral to the efforts to continue with DH, engaging with a private sector energy company who could renew the EfW facility and take-over the operation of the DHN. He states: “I’m not an Engineer or a Planner but I filled a gap.” Champion 14 worked with the Planning department to encourage the energy company to ensure the EfW facility was ‘heat network ready.’ He worked hard presenting the vision with confidence to investors and providing assurances that DH represented a good business opportunity. The environmental goals, as well as the ability of DH to attract inward investment, were highlighted. Although, as champion 14 attests, serious effort was required to bring the energy contractor on board, “DH was viewed as a business distraction.” Leading the negotiations and “building relationships” was pivotal to champion 14’s success. The serious environmental concern posed by the existing EfW created a situation in which DH was no longer capable of achieving its original FP objectives. The will and drive of Champion 14 as well as his LA colleagues was crucial in convincing the private actor that DH was still a viable option for Sheffield. Champion 14 also played a pivotal role in the introduction of another DHN in connection with a biomass energy plant in the North of the city. Champion 14’s initiative and belief in the potential of DH played a key role in the continuation of DH in Sheffield as well as the introduction of new networks around the city. The network is now one of the largest in the UK and the use of energy recovery forms an integral part of Sheffield City’s integrated waste management programme
Coventry

The origins of DH in Coventry can be traced as far back as 1943 when the Council sought to use heat from a very basic incinerator, the ‘waste destructor’ (Participant 16). Participant 16 states that the city of Coventry was heavily bombed during the Second World War, as a result much reconstruction work took place. In 1948, Coventry became the first smokeless zone in the UK, at the time town gas and coal were very polluting, as Participant 16 states, “the Councillors didn’t want to go to all the effort of creating a smoke free zone only to have all soot from dirty energy systems polluting the place.” Thus, DH was considered as an innovative way of improving air quality and maintaining the soot-free status. At the time, the Council approved the sum of £32,000, which is the equivalent of around £1million today for the development of a DHN (Participant 16). Participant 16 states that the intentions for DH were very serious; schematic plans from the time indicate that individual connections in buildings in the city were made ready for DH. However, the pace of post-war reconstruction meant that the quicker option of installing individual boilers presented a more timely option than DH (Participant 16).

In 1975, an opportunity arose again to utilise the heat generated from a new EfW facility. A heat recovery system was installed to enable a neighbouring car assembly plant to receive the heat. For 20 years the car plant used the heat that was generated from the EfW. Following the closure of the car plant, the Council sought the opinion of nearby home owners to establish if they could potentially be new recipients of the heat. Participant 16 states, however, that no one wished to connect. This he surmises was due to DH
being an unknown quantity and the tradition of freedom of choice in the energy market since privatisation.

The emergence of a grant funding stream from the Homes and Communities Agency (HCA) enabled the Council to consider the development of DH once again in 2008. The opportunity to gain access to the funding came from a fortunate conversation between Champion 2, at the time the Head of Climate Change for the Council, and the Head of Environment for the HCA who was seeking to provide opportunities for LAs to gain access to HCA funding. Champion 2’s high level position meant he had both the access to other high-level contacts with valuable information and the professional authority to make use of these resources. Participant 16 stresses that the successful awarding of the £2.1m grant was the key factor which made the project possible: “the first phase of a DH project is extremely expensive, this money was critical to getting the project off the ground.” The Council had a strong desire to reduce energy costs and the carbon footprint of its operations as Participant 16 states:

"The Council has been working to investigate a sustainable way of using heat from waste. The project, called Heatline, involves creating a network of insulated underground pipes to deliver heat from waste, in the form of hot water, to businesses and residents in the city centre."

In order to achieve this ambition, Coventry District Energy Company was incorporated, in collaboration with a private sector DE company. At present, eight buildings are connected to the network in the city centre. A key aim for the DHN is the reduction of the LA’s carbon footprint by over 2,000
tonnes of carbon per year (400 av. Coventry homes) and help to tackle FP in Coventry (Participant 16). Additionally, it is hoped that the sustainable energy system will make the city more attractive to potential inward investors who may wish to link to the project. There were a number of crucial factors that helped to shape the opportunity for DH championing in Coventry. There has been a long-held LA ambition to introduce DH into Coventry city and the existence of the EfW facility provided an important source of energy supply for a burgeoning heat network. The HCA funding provided an important enabling factor allowing the first-phase of the network to be constructed. Champion 2 was central to gaining access to the funding; his high-level network of contacts meant that he had contact with other high-profile connections, one of which proved critical in providing him with the knowledge of the existence of the HCA funding allowance.

**Camden**

The Climate Change Act has driven the agenda for the DH in Camden. The Council developed its own Climate Change Strategy for 2006-2009 which led to the examination of opportunities for carbon reduction in the Borough. A range of scenarios were modelled in order to consider the ways in which the Authority may meet its carbon reduction targets. The report published in 2007, ‘Delivering a Low Carbon Camden’ stressed the importance of DH technology:

*The use of district heating and CHP technologies is essential to meet the necessary CO2 reduction targets. This must also be complemented by other efficiency measures and renewable energy technologies. CHP also offers*
advantages in terms of flexibility in switching to alternative fuels in the future (Champion 7).

In 2010, the Authority committed itself to a 40% reduction in carbon emissions based on 2005 levels by 2020 following a campaign led by the Friends of the Earth Camden (FOE) group. The ‘Get Serious about CO2 campaign’ run by FOE Camden, lobbied the Council to commit to the target and develop a carbon action plan. A heat mapping exercise was performed in 2010, with the aim of locating any clusters of building that could act as a catalyst for DH. Three core areas within the Borough were found to offer the most potential. Champion 7 was appointed to lead on the development of DH in the area, as well as a number of other carbon/sustainability projects. Champion 7 discussing his role states:

_On appointment I concluded a heat mapping exercise to identify opportunity areas and then secured funding from the Greater London Authority (GLA) to develop feasibility studies. A key opportunity in the Euston/Kings Cross area emerged which was contingent on the participation of a major new development. I led the negotiations with the developer at the point of their planning application securing local councillor/cabinet member and Director level support. Significant funding was secured that unlocked the project and it is now in construction._

In 2008, Champion 7 secured £3.8m funding for a gas-fired DHN serving approximately 400 homes and a school. In 2013, another DHN was established utilising the excess heat from a hospital site to Council social housing and was completed in 2013. The third core area for Kentish Town
West is currently out to tender following the successful allocation of HNDU funding.

The Climate Change Strategy, and its commitment to a 40% reduction in carbon emissions by 2020, has helped to shape the opportunity for championing district heating in Camden. Interestingly, a local environment group has had a pressurising effect on the Authority, lobbying it to increase efforts for sustainability in the Borough. Champion 7 was effectively tasked with progressing the DH agenda, however, his efforts were pivotal to building and sustaining organisational support. He worked hard to secure wider LA commitment; including Director level endorsement, councillor/cabinet member backing, as well as leading the negotiations with the commercial contractors. The availability of funding, including the Government HNDU allowance, acted as an important enabling factor for DH in Camden.

_Dundee_

Two separate drives for DH were uncovered in Dundee. The first of which emerged in the Housing Department; Champion 6 has championed the development of DH as a way of providing affordable warmth for tenants experiencing FP.

➢ _Housing Department_

The driver for the development of DH in the Housing Department was,
according to Champion 6, the SHQS (the Scottish Housing Quality Standard), she comments:

*This is the standard laid down by the Scottish Government to be attained by all social landlords by the end March 2015. Energy efficiency is one of the components of the standard and, within this, all properties must reach National Home Energy Rating (NHER) 50 (for gas heated houses), 60 (for electrically heated). One of the major things we did in Dundee City Council to achieve the standard was to install gas heating in our properties. However, when it came to our 11 multi-storey blocks, this was not so simple as it is not our policy to install gas in high-rise blocks. We were mulling over our options just as Community Energy Saving Programme (CESP) funding became available and we met with British Gas who told us that they were very interested in supplying us with CESP funding. By combining this funding with our own internal budgets, we were able to externally insulate one group of 4 multis (collectively called the Dallfield multis) and provide it with gas-fired district heating - this latter entailing an energy centre close to but separate from the flats which housed the large gas boilers and only heated water enters and circulates round the blocks and to the flats.*

The LA was thus driven by its policy obligations to consider the energy efficiency of its housing stock; the availability of CESP funding provided the LA with an opportunity to consider a range of energy solutions. The ability of Champion 6 to develop a strong relationship with the energy contractor was pivotal. The investment, along with physical measures through a Housing Management initiative, “turned the blocks around,” becoming cheaper to heat and more attractive to live in. This led to additional CESP
funding and further improvements through the installation of DH in further blocks. At present, 10 of the 11 intended blocks are served by 4 separate energy centres running independently. Champion 6 states that the development of DH in the Housing department was not part of an overall ‘DH agenda,’ rather it was deemed an appropriate solution for a specific problem:

*I would not say that the development and evolution of our domestic heating schemes was part of a master plan to install district heating. Rather, it was an opportunistic response to a need to supply heating with availability of appropriate funding and a willing utility funder.*

Champion 6 states her role as follows:

*As my role was in being aware of funding sources and building relationships with utilities.... I would say my motivation came more from a place of trying to comply with SHQS and, in so doing, to have an impact on fuel poverty.*

The Housing department, according to Champion 6, adopted a “*not just bricks and mortar approach;*” the problems inherent in the tower blocks were not limited to FP, there were other social problems including drug use which needed to be addressed. In this sense DH was part of a holistic approach to what Champion 6 calls, “*making a better neighbour.*”

➢ Engineering Department

The 2nd drive for DH in Dundee stems from the Engineering Department.
Champion 16 who works in the Engineering department states his role as follows:

*Over the past two years I have been putting forward suggestions for possible district heating projects. Menzieshill Development, Coleside Development, City Centre Proposal & Waterfront Development. I originally did a report for the development of a scheme in the Whitfield area of Dundee linked to the Incinerator plant partly owned by Dundee City Council. I am also involved in looking at a city network also. Dundee has a city wide working group looking at District heating of which I am part of.*

According to Champion 16, of key importance is to:

- Develop a long term investment plan/strategic master plan
- ‘Join the dots’ to visualise a city wide system using heat map.
- Investigate the competitive issues with gas
- Potentially form a City owned ESCO
There is a strong and growing agenda for DH in Dundee Council, DH has already been effectively deployed in Council housing stock and as champion 16 states, “We are beginning to look at the link between Commercial and domestic.” The establishment of a working group means that DH is being considered at a strategic level, something that champion 16 has enthusiastically campaigned for. Champion 16 has, for the past two years, worked to progress the DH agenda on his own initiative, commissioning a number of studies and taking a study trip to Europe to learn more about the technology. For champion 6 her opportunity to champion DH can be considered the result of a combination of contextual factors; the availability of funding support from a willing commercial partner, the obligation under the SHQS, the inability to use gas in high rise domestic dwellings, as well as the pressing need to address the FP problem amongst the Council’s housing tenants. Her ability to build and develop a relationship with the private sector partner was pivotal to the success of the DH initiative.

Renfrewshire

Champion 5 worked for the Energy Management Unit (EMU), but was seconded to the Housing Department to support their delivery of the SHQS and its Fuel Poverty Strategy, as Champion 5 states:

The FP strategy set me targets to research, review, consider and develop renewable energy solutions, We had two DHS in Paisley and they were both in need of fixing so I was asked to look into the possible solutions and costings.
One system which had 7 boilers each feeding between 10-40 homes was “an administrative and physical mess” and Champion 5 opted to reinstate individual boilers. The other CHP DH system hadn’t been commissioned and Champion 5 worked to secure funding support through the RHI and the FIT. This led Champion 5 to consider the long-term options for DH in the area driven by the FP objectives. It was around this time that he saw the need for further study into DH and FP and embarked on a PhD. From 2013-15, Champion 5 worked as part of the Energy Section in a new post; he aims to utilise his network of contacts in the LA to push ahead with DH. For Champion 5, DH was perceived as way of addressing the FP problems in the area, whilst two DH systems were in existence, there was a limited formal approach to DH. The SQHS and later the Fuel Poverty Strategy have helped to shape the opportunity for championing DH, although the initiative and drive of Champion 5 has maintained the organisational agenda for DH. Champion 5 was effectively tasked with considering the options and costings for the two DH schemes, he then began to consider the long-term prospects for DH in the area and sought to find out more about DH and FP. He was so enthused to learn more that he put together a research proposal for a PhD on the topic which he is now close to completing. The initiative of Champion 5 and his genuine interest in DH and FP alleviation is helping to further the DH agenda in Renfrewshire.

_Barnsley_

A former coal mining town, Barnsley had a predominance of coal-fired heating systems. In 2004, Barnsley Metropolitan Council had 133 coal-fired
boilers at 66 premises (mainly primary schools), including 26 district heating schemes with a combined consumption of 6,500 tonnes of coal per year (Champion 12). A number of efficiency measures for coal boilers were implemented throughout the 1980’ which resulted in a reduction of coal use by 20%. However, by 2004, many coal boilers were due for replacement, prompting ideas for innovative solutions.

Champion 12 embarked on a fact-finding trip to continental Europe with South Yorkshire Forestry, he says, “when you see what they’re doing over there, it’s so simple and makes sense, we are so backward in comparison.” This led Champion 12 to propose the idea of a ‘Biomass Implementation Strategy,’ which commits the Authority to considering biomass heating systems in all new and refurbished buildings. The first DH initiative was the installation of a wood- fuelled DH scheme for 166 flats followed by a biomass DH system for a Council department which was financed through a number of grants including Yorkshire Forward (a Regional Development Agency now replaced by a Local Energy Partnership). Further DH systems are being installed as part of a progressive biomass installation programme. Effectively, the legacy of coal-fired heating systems and the need to improve energy efficiency in Barnsley led to the search for alternative solutions. It was the initiative of Champion 12 that led to the proposal of the biomass solution. Champion 12 says of his role:

*Council Members had experienced many difficulties with District Heating before I came on to the scene. Over time, once I had sorted out the inherent problems, I was able to convince them that when properly engineered DH was an asset that provided a better solution than multiple boilers serving*
individual properties.

The opportunity for championing DH in Barnsley was shaped by a number of critical contextual and human capital factors. Champion 12 had for many years been relied upon by the Council Members and Management to provide innovative solutions to existing organisational problems. This had enabled Champion 12 to develop a credible and trustworthy reputation and a certain degree of creative flexibility. This autonomy enabled Champion 12 to act on his own initiative in delivering organisational solutions. The need to reduce coal consumption in the Borough as part of a sustainability drive and improve energy efficiency shaped the opportunity for championing. The study trip enabled Champion 12 to witness the benefits of biomass in other parts of Europe and helped him to develop the belief that biomass could deliver similar benefits to Barnsley. His initiative, enthusiasm and dedication have ensured the successful introduction of the Biomass Implementation Strategy and has generated significant organisational benefits.

Swindon

Swindon Borough Council (SBC) presented ambitious plans for energy projects through its Swindon Sustainable Energy Framework (SSEF), which aimed to adopt a co-ordinated approach to the development of renewable energy infrastructure (Champion 10). Champion 10, through his role as a Senior Planner and his work on the Local Plan, sought opportunities for delivering sustainable energy solutions in Swindon. It was during his research into potential energy solutions that he by chance came across a
Swedish DH Consultancy who at the time were working with another LA in the UK. The consultants worked collaboratively with UK LA’s in a knowledge-sharing manner. After securing part-funding (the Swedish consultants also had Swedish Government funding support for overseas work), the Council embarked on a DH master-planning study. This was with the aim of highlighting any potential opportunities for starting a DE scheme in the Borough. Further feasibility work aims to establish the potential indicated by the high-level master-planning work. As Champion 10 explains:

After creating sustainable construction policies for the local plan, I was looking for more strategic opportunities to deliver a sustainable energy solution for Swindon. I was exploring issues of municipal heat and energy and by happenstance came across BIZCAT, a Swedish District Energy consultancy. Jointly funded by SBC and the Swedish Government, we undertook heat master-planning for Swindon. This was followed up by more detailed work by British consultants on individual opportunities.

As such, the work associated with the SSEF and the Council’s Local Plan helped to shape the opportunity for championing; by chance Champion 10 uncovered a Swedish DH consultancy who worked collaboratively with UK LAs. His search for sustainable energy solutions led him to realise that DH could be a viable energy option for Swindon and, employing his own initiative, raised DH as an option and actively pursued the technology.
The Isle of White

The Isle of White Council, through its ‘Eco Island initiative,’ has ambitious environmental aims of achieving the lowest carbon footprint in England (Champion 4). Champion 4, as the Principal Officer for Low Carbon Projects, initiated the generation of a heat mapping study which specifically sought to identify the areas of highest heat density with the aim of supporting DH development. Champion 4 states:

District heating systems can significantly contribute towards the Island’s targets to achieve the lowest carbon footprint in England. Provision of this heat by renewable or other low carbon fuels will result in a sustainable reduction in carbon emissions.

By using the planning process, supported by the Code for Sustainable Homes to encourage developers to install DH or connect to a DH network where possible, the Council is adopting a policy-led approach. Thus far, one DH system has been established in a new build domestic development, Champion 4 states:

The one system we have up and running is at Bluebell Meadows, a Barratt Homes development in Newport. This was council-owned land and, as part of the disposal to a housing developer, we specified a requirement of Code for Sustainable Homes Level 4 whilst leaving it to bidders to decide how best to achieve this. Barratt Homes specified a district heating system for the c. 900 dwellings which is fired initially by gas but will be converted to biomass once sufficient homes are occupied. The development of the DH
policy was something we did voluntarily and the Bluebell Meadows scheme gave us confidence that it was achievable.

Champion 4 explains the stance adopted:

Our work has focussed primarily on developing a planning policy which promotes district heating in new developments. To my mind this provides the best long term solution, since DH becomes part of the norm rather than the exception. Granted, we are unlikely to have many new developments of the size that will trigger the DH policy as it stands but, hopefully, as it becomes better understood and accepted, it will be installed in smaller developments to meet customer demands.

Although there is a strong organisational agenda for DH it was the initiative of champion 4 that raised the DH agenda:

Some funding was made available for the development of renewable energy projects and it was my decision to commission the Heat Mapping Study as an essential piece of evidence for the DH policy. It is also useful in raising awareness of DH and would be a source of information for anyone looking to develop a DH scheme, either as part of a residential development or separately.

Champion 4 stated that they had been shortlisted for the ETI’s Smart Systems & Heat programme and, whilst not selected as one of the final 3 areas, the ETI’s work demonstrated the significance of focusing on low carbon heating and the role that DH played. He was also aware of how
beneficial DH has been in other parts of Europe:

*I have carried out some modelling of Island carbon emissions and it was clear from that work that deep cuts in carbon emissions were unlikely to be achieved without the widespread adoption of DH i.e. retrofit as well as new build. This is the case even when the DH is fired by fossil fuels, but a renewable feedstock, or waste heat, would provide greater benefits. DH has been widely adopted on the Continent, but the UK seems to have failed to learn many lessons from this until recently.*

It is, however, recognised that DH is not a panacea: “There is a recognition that in some circumstances a DH scheme may not be technically or financially viable, but the onus is on the developer to prove this is the case” (Champion 4). The Isle of White has developed a strong organisational agenda for the promotion of DH through a policy-led approach, aiming to encourage developers to install DH networks on new build sites. The availability of funding enabled Champion 4 to take the opportunity to commission the heat mapping work; it was his initiative and enthusiasm for the technology that led to the development of this important piece of evidence.

Leeds

Champion 8’s official job remit as Energy and Climate Change Manager involved developing initiatives for to combat climate change: “I was originally appointed to lead on climate change so not specifically on DH, but it emerged as a very sensible technology to use to decarbonise heat.”
Contextual issues were highlighted as key factors which shaped the championing attempt at Leeds: “The fact that we are building an incinerator means that we have a large heat source with little demand close by so DH solves that problem.” Leeds City Council received grant funding under the DECC Low Carbon Pioneer Cities Programme, a project designed to encourage area-wide carbon reduction policies. This led to the development of decentralised energy masterplans for Leeds City, as well as the Aire Valley and Huddersfield Town Centre. There is a desire in Leeds City Council to move away from the more opportunistic approach to DH which has seen networks established in areas of regeneration or high density social housing, to a more strategic approach (Champion 8):

The council has a unique opportunity to create a citywide district heating network over the next 10-15 years. This will connect some of the relatively small scale district heating networks already in place and allow new networks to expand rapidly to enable existing buildings to connect and new developments to be built with district heating connections in place.

The strategic vision for DH in Leeds centres on the EfW plant as a primary asset (Champion 8). The Council in Leeds is adopting an ambitious approach to DH taking into account some of the key issues surrounding DH, namely the jobs and skills base needed to deliver the project and the local supply chain. There is also discussion of having a community benefit fund which could help to finance a visitor centre for the energy scheme. Framing DH as an organisational issue was a critical part of Champion 8’s strategy: “showing senior managers and members how this supports our corporate priorities.” DECC’s Low Carbon Pioneer Cities programme and the
Strategic Heat Programme (SHP) have shaped the opportunity for championing DH in Leeds. However, Champion 8 has led the feasibility investigations and has worked to convince Senior Management and Council Members that DH fits the organisational objectives.

_Fife_

Fife Council operates one district heating scheme in the town of Dunfermline. During 2002/2003, with the announcement of the Community Energy Programme (CEP) grant funding, the Council sought to establish the potential for DH in the town; two areas were considered possible, Dunfermline and Cowdenbeath (Champion 4). Scoping studies were performed confirming the potential for both areas; plans were consequently made to install gas-fired CHP units in leisure centres and supply small heat networks which would feed out from the leisure centres. However, due to a lack of space in the leisure centre in Dunfermline it was not possible to install a CHP system. Instead, the Council saw the opportunity to use an alternative heat supply utilising the heat recovered from landfill gas engines which were due to be installed on a Council landfill site approximately a mile outside of the town (Champion 4). The business cases, technical specifications and tenders were prepared for both systems; the Council submitted an application to the CEP for funding and both schemes were successful (Champion 4). However, due to higher than anticipated costs the Council could only afford to go ahead with the one scheme in Dunfermline. The construction of which began in 2005, but due to protracted contractual issues, formal completion happened in 2011, although heat has been supplied since 2006. The scheme supplies heat to
213 flats, in 3 multi-storey blocks, 2 care homes, a leisure centre, fire station, an NHS clinic and 2 schools. The district heating network is based around the use of heat that would otherwise be rejected from the engines operating at the landfill site to generate electricity. The development of the scheme is intended to demonstrate low energy design and has a high public profile (Champion 3). Champion 3 states, “Throughout my career I have had a strong interest in the efficient use of energy which was one of my motivations for pushing forward with the district heating projects." The LA has the desire to develop further DH networks in Fife, however Champion 4 states, “Unfortunately so far we haven’t been able to get these to a stage where they are financially viable enough for the Council to take them forward.” Champion 3’s strong interest in energy efficiency drove him to progress the agenda for DH within the LA. The availability of grant funding through the CEP was an important enabling factor which helped to shape the opportunity for championing in Fife.

**West Suffolk**

For WEST Suffolk Council, its commitment to the ‘Creating the Greenest County programmes’ target of a reduction in carbon emissions of 60% by 2025, as well as growth predictions for the area, acted as a strong local driver for DH: ‘This growth needs to be sustainable, low carbon and energy secure, delivering the type of place to which the community, business and stakeholders can aspire’ (Champion 15).

As such, local policy drivers led the Authority to investigate DH through a Bury-wide heat mapping study, which would form the evidence base for the
Bury Area Action Plan. Unusually, local organisations showed a keen interest in DH, particularly British Sugar, who have a factory in the town which operates a CHP unit, as well as registered social landlords and housing developers.

As a consequence, HNDU funding was used to commission a detailed feasibility studies, which indicated the 3 areas that present the most potential for DH (Champion 15). As part of this investigation, consideration was given to the business opportunities and the availability of local skills. DH was one of a number of renewable technologies which were considered including biomass, wind turbines and solar PV. Indeed, it is recognised by Champion 15 that DH is not suitable in every circumstance and that in the case of the low density dwellings in the town, stand-alone micro generation technologies may be a more suitable option. As such, the projected growth for the town coupled with a commitment to reduce carbon emissions and improve sustainability have shaped the championing opportunity. An important factor in this case is the local interest from organisations in the town, one of which could potentially be a significant heat source for a prospective network. Indeed the interest in utilising this waste heat from British Sugar, as well as from other organisations in the area has created momentum for the DH agenda.

Woking

In 1990, the Council developed an Energy Efficiency Policy with the aim of reducing its environmental burden and improving FP in the area. This policy led Woking Council to pioneer a number of renewable energy
technologies including solar PV systems, CHP and trigeneration. DH is part of a wider renewable energy agenda at Woking Council. The Council established an ESCo, (Thameswey Limited [TW]) which was incorporated in 1999, later forming Thamesway Energy Limited (TEL) as a wholly owned subsidiary (LEP, 2007). As Participant 17 states:

Woking Borough Council has received national recognition for its path-finding work on decentralised energy, and has received a number of awards including Beacon Authority status for its sustainable energy initiatives. In 2001 it was the first Local Authority to receive the Queen’s Award for Enterprise. Woking was the first Local Authority in the UK to set up its own community trigeneration scheme and in 1999 established its Energy Services Company (ESCo) Thameswey to operate and develop its networks. The Council is committed to assisting other Local Authorities in developing low carbon community energy and, through Thameswey, forming new joint ventures for delivering innovative community energy projects.

Interestingly, the Council, through its consulting arm, is dedicated to helping other LAs in the country develop their low carbon community initiatives and actually invests in community energy initiatives elsewhere in the country. Woking Council has a strong and widely recognised organisational agenda for DH and renewable energy more generally. It has, however, been driven and shaped by the motivations and personal beliefs of its champion who strongly believes in the importance of societal fairness and community benefits. This was evidenced by his desire to, “give back to the community,” and ensure that the Thamesway Group was a non-profit entity with profits generated being reinvested for further community energy projects.
(Champion 13). The Energy Efficiency Policy coupled with the personal beliefs of the champion helped to shape the opportunity to champion innovative energy solutions in Woking. The following sections consider the ways in which the champions created the forms of (organisational) social capital necessary to pursue their championing endeavours, as well as the system building strategies employed, thus answering the ‘how’ of champion origins.

7.3 Organisational Features

7.3.1 Structural Social Capital

The district heating champions established structural connections with a range of actors both internal and external to the organisation. This was done through cross-departmental meetings, steering groups, presentations and face-to-face lobbying. Internal networks of ties were created that enabled access to the specific social capital resources of knowledge and information-sharing legitimising support and political gravitas. Champion 17 emphasises the importance of establishing an appropriate support network, discussing how he worked at, “assembling, building and leading the right professional team.” Establishing the necessary connections with different departments could be quite challenging; the participants were asked to rate their opinion on the following statement, "There isn't a strong sense of unity within the Council, each department drives their own agenda, often with little cross-departmental cooperation.” The participants could rate their preference on a scale of 1-5; 5: strongly agree, 1: strongly disagree. The
median score for the data is 3.5. Two participants, Champion 5 and 11, strongly agreed with the statement, scoring a 5, one champion (Champion 17) neither agreed nor disagreed, whilst 6 participants agreed with the statement (scoring 4), and 6 disagreed with the statement.

It is difficult, therefore, to establish the extent to which employees within the LA as a whole feel interconnected. Despite broad similarities in terms of the administrative makeup of local Councils, each Council is essentially a unique bundle of human resources. Critically, Champions as system builders must unite different actors from disparate departments and functions with divergent agendas, in order to create a common goal. Champion 5 emphasises the political nature of the public sector organisation which makes this task particularly challenging:

*Internal politics is a reality of all councils and all offices wherever we are. Different sections rub against others, individuals have their own agendas. Such is life. It is perhaps seen as more political in the public sector as ultimately we must answer to political masters in the form of councillors….our job as officers is to advise our councillors and endeavour to direct them in what we think is the best option deliverable with the available resources.*

When asked to rate the following statement, ‘District heating is a team effort,’ the median score for the data set was 4.5, indicating a strong agreement with the notion that DH is reliant on the efforts of many organisational members. Champion 1 further supports this assertion, linking his varied experience within the LA with his ability to gain support stating,
“It was a great advantage in having worked with many different departments over the years to get the contacts that were needed to fast track the project.” The system builder must establish a network of actors and organisations who are able to provide the skills and expertise needed; district heating is an energy system that fundamentally requires a collective effort.

The Planning, Housing departments and the Members/Councillors were deemed pivotal connections. The Housing and the Planning departments were viewed as central to supporting the DH initiative. Considering specifically why these departments in particular represent important sources of social capital one must consider the resources they possess. The Planning department may be considered as vital in assisting with the high level feasibility work associated with DH, including heat mapping and master-planning, and can be considered as significant sources of knowledge of current and planned developments. The Housing department may also possess crucial knowledge on the level of FP in Council housing stock and thus aid in framing the DH agenda. The following senior management staff were also variously indicated as vital:

- Director of Culture and Environment
- Director of Planning
- Director of Housing
The mobilisation of high level support is integral to the championing endeavours. High-level support acts in a legitimising capacity, and senior actors, through their own high-level network of ties, help to further the agenda for DH. Champion 6 stated that management support for DH in her LA was strong from the beginning: “I needed to go to my boss to ask if the funding and the project should be pursued, so my boss was on side from the beginning.” Only Champions 3 and 11 indicated a lack of internal support: “I didn’t initially have support, but did after getting buy-in from the Environmental Services Director of the time” (Champion 3). Champion 11 indicated a lack of initial senior management staff: “Senior Management were in the main not interested until it happened and political support was achieved.”

Indeed, Members or Councillors were stated as important sources of internal support for championing a DH initiative; it would seem that these individuals played significant roles in raising the DH agenda. Champion 11 emphasised the importance of a political champion, the Deputy Leader at the time. Champion 11 also suggested that the members in his LA wielded significant influence: “…they call the shots!” Likewise, Champion 17 stressed the need for an ‘influential political champion.’ Champion 13 stated that in his Council there wasn’t an overall political majority, but he
emphasised the importance of engaging with a passionate individual in each party.

Champion 9 emphasised the ever-changing political situation at her Council and the importance of continuity for a DH system: “I didn’t want DH to become a political party football,” as such she presented DH differently to each party to ensure it met their objectives: “that was a big part of my job, all parties supported DH, I pushed for that long-term strategic view and I want to keep it that way.” This suggests that a certain degree of packaging and re-packaging of DH is necessary in order to appeal to actors with a range of different objectives. A feature unique to the organisational context of public sector champions is the layers of bureaucracy (Senior Management, Members/Councillors, colleagues) that the champion must penetrate. As supported by Winistorfer (1996), a DH champion must appeal to, and gain approval from, Senior actors, the Chief Executive, as well as Members, who may share different political allegiances.

The ability of the system builder to gain support for DH rests to a large degree on creating a broad and yet tailored appeal for DH. This depends on the objectives of the influence target and requires some investigation on the part of the champion.

Champion 14 stated, “Labour were keen…..they were instrumental, the Lib Dems were not so keen.” The political context of the public sector LA changes and the dynamic nature of the political makeup presents a challenge for DH champions who must ensure strong momentum and long-term support for the innovation. Champion 9 stressed the importance of shrewd
tactics in building political support: “I would never go myself to collect an award, I would send a local Councillor to collect any awards we received.” This was a successful tactic as Champion 9 states how one dire-hard critic (a Councillor), become their strongest supporter. These actions are typical of the system builder who must use any means to enrol those crucial actors into the shared purpose, even manipulation.

Gaining member support was seen as critical to championing efforts, naturally the political make-up of each LA will vary from context to context, as such each political party will have their own views on energy and the environment; the key as Champion 9 states is to package DH so it appeals to the objectives of each party. As well as strong ties, weak ties also proved pivotal.

*Structural Holes*

Internal networks of ties were insufficient in gaining access to the relevant resource of expert knowledge on district heating both technically and economically. As a LA generally has limited experience in large-scale energy projects of this nature, structural holes enable the champions to access the expert knowledge which existing networks cannot provide. The ability to gain access to these resources is shaped by the public sector context; as a public sector body, the champion must adhere to strict regulations on tendering and supply of services. Due to the lack of internal DH capabilities there is a high ‘use value’ placed on expert DH knowledge. The champions highlighted the following key external actors as significant in supporting their efforts:
• DH consultants (including a Swedish consultancy and Danish consultancy)
• UK Energy Company (as funder and main contractor)
• A specialist biomass manufacturing company and their franchises
• CHP expert
• Funding agency (HCA)

As can be seen, critical external actors range from funding experts to energy companies to technical DH experts. Interestingly, the most crucial support for Champion 9 came from an external technical expert; “Throughout the CHP Engineer was my closest ally - without him I might have given up!” Champion 1 also stressed the importance of the technical knowledge he gained from his contracted Danish consultants. Champion 10 also praised the Swedish DH experts he employed. Due to the nature of DH technology i.e. a large-scale infrastructure project, a broad range of expertise both internal and external to the Council is required. The system builder must balance a range of perspectives and potentially competing stakeholder objectives; a challenging task requiring significant communication and negotiation skills.

Forging connections

Creating networks of ties with actors and organisations with divergent goals and agendas can present a challenge for the system builder. A number of
barriers emerged, reflective of the nature of DH as a large-scale complex infrastructure, as well as the public sector organisational context. Champion 4 reflects on the difficulties of implementing an unknown technology: “There was a lack of knowledge amongst colleagues and concern over impacts of the Energy Centre.” Champion 11 likewise discusses the:

.....misunderstanding from finance not getting the model, Obstacles to change and fear of not having a boiler! Also we were dealing with three public sector organisations at first NHS, Uni and BCC. We had to break this down into phases or we would not have got it off the ground.

Champion 8 stressed the lack of internal resources as problematic, whilst Champion 9 suggested that entrenched organisational practices presented a challenge:

Inertia within the Council ("we always do it this way" - ok so we have always done it wrong!). Need to ‘work round’ blocking individuals - doesn’t necessarily make you popular! Bureaucratic procedures (better to get something done and apologise later for not following the correct procedures, rather than losing the opportunity).

Champion 14 also stated that he was constrained by public sector contractual requirements that acted to “prevent innovation, expansion and diversification of activity...as well as the bureaucracy of public spending and State Aid.” This is echoed by Champion 3, who also identified contractual issues: “we did have some contractual issues with the build contractor which dragged on far too long.” For many of the champions,
establishing a viable business case presented a serious challenge. As participant 10 states, ‘the LA would not connect public buildings in the region if it meant running a great length of pipe in order to connect.’ This is supported by Champion 15 who stressed the relevance of presenting a sound financial case: “There is good support for local generation if the finances are good.” Champion 10 also stated, “We got over a lot of barriers, but the big struggle was the IRR and business case.” Champion 16 likewise states: “The biggest challenge for District Heating is the business case against gas costs, when a city is fully on Gas.” Champion 1 also emphasised the technical decisions surrounding DH as challenging: “There were so many decisions to be make on things like operating temperatures, tariffs, metering, T&C…I felt like a fish out of water but having Danish consultants who had done it all before was a great help.”

Enrolling crucial actors, outside and inside the organisation, was seen as a key issue. Champion 1 discusses the challenge of: “…..Winning over customers for a project with no proven track record in the UK.” Likewise Champion 17 found the general attitude to be, “If it was any good why it hasn’t taken off elsewhere first?” Champion 11 also writes of the sceptical nature of some who were suspicious as to why DH hadn’t been adopted elsewhere. Champion 13 emphasised the importance of institutionalising change which rests on a collective effort: “Team effort is important, you may speak to people who say it’s down to one person, it’s not, you need political support (to raise the agenda).” He also emphasised the importance of “winning the hearts of people” otherwise, “when the champions leave you’re in trouble.”
Champion 9 acknowledged organisational obstacles but stressed the importance of enrolling the right persons:

*There were barriers internally, you just have to go around them. The Director of Housing was one key person who was relatively easy to bring on board, as he knew of the Energy Efficiency Advice Centres and the need to address FP. And DH was a good move to overcome probs. Another key person was a Councillor with technology background, he knew how to use technology for social problems.*

A pragmatic approach to obstacles was generally adopted; for champion 12 there did not seem to be any acknowledged hindrances:

*I had good support, any obstacles? No! quite the contrary, the members had for years relied on me for solutions to many problems, I was used to them coming to me for solutions, they trusted me, Even if they don’t understand it (DH) they trust me and they can see potential. No challenges or barriers! Unbelievably there were none - it was like pushing at an open door. Sure there were some who were waiting for me to fall flat on my face - but it never happened.*

It is clear that in the case of Champion 12 his lengthy LA experience in his position had enabled him to build a credible reputation and he was trusted internally. The attitudes of organisational members can also be considered as hindrances; the existing entrenched practices and ‘ways of doing things’ presented a challenge to system builders who needed to utilise their own human capital resources, such as enthusiasm and persistence to overcome
these obstacles. On the whole, the champions adopted an optimistic and relatively calm attitude to the presence of barriers, as Champion 9 states, “There were barriers, certain people, but then they just left me to it, there will always be people who won’t agree with you... just get on with it.” Likewise when discussing the issue of support, Champion 9 makes an interesting point, ‘Support? You have to build support, you don’t just have it, you have to build it.’ Champion 9 doesn’t take for granted that people will blindly follow her due to her organisational reputation, she realises that she needs to win people over. The ability to develop new network ties and develop structural social capital is crucial, particularly creating connections with those in different networks of associations who possess the resources that are necessary for the championing endeavour. Exploiting those connections and engendering the support of key individuals relies on the ability of the champion to infuse these relationships with an affective quality.

7.3.2 Relational Social Capital

The champions’ ability to exploit existing relationships and, where necessary, establish new connections is inherent to his/her championing success, and is contingent on their ability to develop an affective connection with the relevant actors. The participants were asked to rate the following statement, “I couldn't have succeeded in championing District Heating without the support of my colleagues;” a median score of 5 was obtained. The strong overall agreement with this statement suggests a high value attributed to colleague support. Interestingly, the lowest scores of 2 were
given by Champions 5 and 9, both of which have stressed the presence of internal obstacles. The overall strength of feeling for colleague support was extremely positive, giving credence to the notion that rather than a lone pioneer, the DH champion is a critical part of a team effort, one which relied on the champion’s ability to create and strengthen relational social capital.

Enrolling others into the shared purpose necessitated the tactical exploitation of relational aspects of social capital. Relational social capital is important as it is the affective nature of the relationships within the networks which enable the champion to reap the benefits associated with a relationship based on trust, liking, perceived obligation and mutual identification (Bolino et al. 2002). The ability of the champion to achieve this can be considered a function of his/her human capital characteristics, i.e. personality and organisational citizenship behaviour (OCB) as well as organisational factors such as framing the initiative and the champion’s ‘position of power.’ These aspects will be examined in further detail.

*Engendering Trust*

The champion’s ‘position of power’ can be considered as a function of his tenure and/or authoritative status, and is a significant source of championing power. Table 7.2 displays the job title of the participants and approximate length of time each champion has spent in their respective LA positions at the time of pioneering DH.
<table>
<thead>
<tr>
<th>Champion</th>
<th>Position</th>
<th>Length of time in role at time of championing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Divisional Manager, Engineering Services</td>
<td>18 years</td>
</tr>
<tr>
<td>2</td>
<td>Head of Sustainability &amp; Community Programmes</td>
<td>6 years, 9 months</td>
</tr>
<tr>
<td>3</td>
<td>Energy Engineer, Team Leader</td>
<td>21 years</td>
</tr>
<tr>
<td>4</td>
<td>Principal Officer, Low Carbon Projects</td>
<td>9 years</td>
</tr>
<tr>
<td>5</td>
<td>Energy Officer</td>
<td>2 years</td>
</tr>
<tr>
<td>6</td>
<td>Programme Development Officer (HECA Officer)</td>
<td>26 years</td>
</tr>
<tr>
<td>7</td>
<td>Sustainability Manager</td>
<td>6 years 9 months</td>
</tr>
<tr>
<td>8</td>
<td>Energy &amp; Climate Change Manager</td>
<td>8 years</td>
</tr>
<tr>
<td>9</td>
<td>HECA Officer then Energy Manager</td>
<td>4 years</td>
</tr>
<tr>
<td>No.</td>
<td>Position</td>
<td>Experience</td>
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<td>-----</td>
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</tr>
<tr>
<td>10</td>
<td>Senior Planner</td>
<td>9 years</td>
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<tr>
<td>11</td>
<td>Principal Mechanical Engineer</td>
<td>2 years</td>
</tr>
<tr>
<td>12</td>
<td>Principal Designer (Building Services) &amp; Energy Engineer</td>
<td>24 years</td>
</tr>
<tr>
<td>13</td>
<td>Director of Finance</td>
<td>10 years</td>
</tr>
<tr>
<td>14</td>
<td>Head of Environmental Strategy</td>
<td>1 year</td>
</tr>
<tr>
<td>15</td>
<td>Environment Manager</td>
<td>18 years</td>
</tr>
<tr>
<td>16</td>
<td>Team Leader, Mechanical Engineering</td>
<td>23 years</td>
</tr>
<tr>
<td>17</td>
<td>Director of Finance</td>
<td>1 year</td>
</tr>
</tbody>
</table>
The length of time spent in the role prior to championing DH ranges from 1-26 years. Interestingly, those who have had the shortest time in their current role prior to progressing the DH agenda were either those champions in high level positions, such as champion 2, 14 & 17 or as in the case of champion 1, 5, 7 & 11, had worked in a LA with a strong organisational agenda for DH. Those champions who held lower-level officer positions had established strong reputations, built up over many years of LA service prior to attempting to innovate. Through their lengthy service and reputation as reliable, and, in some instances, credible problem-solvers, the champions can be considered as loyal to the organisation. The higher level champions by contrast appeared to instigate change earlier in their LA career. This could be argued because senior participants had a greater degree of power and authority and were perhaps more expected to instigate change as part of their high profile positions.

For those officer-level champions who were not in authoritative positions, their reputation, often established over many years of continuous service, were significant sources of power; their credibility as dependable problem-solvers was an integral part of building the relationships needed to progress their DH agenda. Their standing in the workplace engendered trust and confidence; useful tools in building a support network in which actors are willing to reciprocate with information, assistance and support. As champion 12 states:

*The members had for years relied on me for solutions to many problems, I was used to them coming to me for solutions, they trusted me, even if they don’t understand it [DH] they trust me.*
Likewise champion 1 states,

*I got quite a good reputation both in the council and beyond in my previous work in Shetland for sorting out engineering problems and delivering projects on time and on budget.*

This human capital enabled a strengthening of organisational relational social capital. The participant’s strong workplace reputations coupled with the perception of their willingness to go ‘above and beyond’ their official duties; (OCB functional participation) and promote and actively support the organisation’s interests (OCB loyalty), create a positive workplace persona. As Champion 9 states, “I would often work weekends during the first few years.” Champion 1 believes that his LA experience enabled him to build a network of contacts which helped him to ‘fast track’ his proposals.

The most senior champion, Champion 13, was the Director of Finance at the time of raising the DH agenda, he has since become Chief Executive and his role involved managing resources more efficiently. In discussing the fact that it is relatively unusual for a finance executive to champion an energy/environment initiative he stated, “*My finance position was just a means to an end, just convenient, I was always good at numbers, I assessed the threats to business, and I viewed climate change as a threat to business.*” Champion 13 identified two project-level individuals who play an important role, one a CHP enthusiast and another individual a Technical Officer, “*the nuts and bolts technical guy.*” He discussed the fact that he didn’t have a technical background or even an in-depth knowledge of DH: ‘*I’m an accountant not a ‘techy’ I have a veneer level knowledge of most subjects,*
Champion 17, like 13, was also the Director of Finance for his LA at the time of championing the DH agenda and also expressed the need for an Officer-level champion, “You need a high level officer champion and an influential political champion.” Champion 14 also emphasised the lack of a technical background: “I’m not an Engineer or a Planner but I filled a gap….I built the crucial relationships.” It is also clear in the case of Champion 2, that the high-level connections he was privy to as Head of Climate Change had a strong influence on the success of driving forward the DH initiative, “By fortune I bumped into the Head of Environment for the Homes and Communities Agency (HCA), who was looking for ways to give Local Authorities opportunities to access their funding allowance...I pitched the idea to Cabinet members and Senior management....” The access to high profile contacts enabled the project to be progressed relatively smoothly. When asked about the coordination challenge for project teams Champion 2 responded, “It’s really quite simple in this case because it was a high level initiative.”

Interestingly, Champion 9 indicated that when she started as a HECA Officer the post was a brand new position due to recent enforcement of HECA legislation and as, “not every LA was doing it,” it meant that she had the freedom and autonomy to put her own stamp on the position. Crucially, as there weren’t many other HECA Officers in LAs when it came to bidding for funding there wasn’t a great deal of competition. Upon remembering winning the funding required she remarked, “The Senior Management Team and the Finance team let me get on with it, when I was bringing in grants
(£1m odd), I said I’m deciding what to do with that! They didn’t object to what I do.”

Likeability

The champions’ high levels of agreeableness, as well as openness and conscientiousness, create a persona of compassion and helpfulness, originality and competence which are useful champion resources that engender the trust and respect of key actors. The champion’s displayed altruistic OCB and loyalty in the way in which they framed the initiative as beneficial to the local community, both socially and environmentally. The ‘likability’ factor thus increases the willingness and likelihood of actors to lend their support to the champion. Although, by the very nature of their championing action the champions are seen as disruptive of the status quo, and threatening to the organisation’s existing ways of doing things (displaying COCB voice and advocacy participation). As such, AOCB’s are critical to ensuring that the champion appears to be acting in the organisation’s best interest, rather than a renegade individual. Loyalty and obedience OCB’s are thus important; the way in which the champion frames the DH initiative and the rational strategies are vital to engendering support in the public sector context. Ultimately the champion cannot be seen as a renegade municipal worker if is he/she is to secure the support of crucial organisational actors.
Perceived Obligations

The champions exhibited a strong awareness of their responsibility as servants of the public, (obedience) this was demonstrated by the desire to ensure transparency, benefit the local community and achieve social objectives such as affordable warmth. As Champion 7 states “value for money was key, so was ensuring the residents connecting to the scheme were comfortable with the idea” (Champion 7). Champion 1 states:

I got quite a good reputation both in the council and beyond in my previous work in Shetland for sorting out engineering problems and delivering projects on time and on budget. Being in a small community you get to know the people affected by the projects you are working on.

Champion 5 indicates a strong awareness of his public sector duty: “This is an integral part of the job of any civil servant.” Champion 9 declares, “My motivation was the punters i.e. the circumstances of the occupants in fuel poverty living in the multi storey blocks.” Champion 12 is also acutely aware of his public sector duties: “Extremely! After all Council Members were expecting me to perform - especially in the light of their previous experience.” Champion 8 states that for Leeds DH is a crucial tool by which to alleviate the social problem of FP: “Very.

“Very. We hope to use DH as a way to reduce fuel poverty amongst some of the most deprived residents in Leeds.”
Although Champions 2 and 11 adopt a broader view to their role, as Champion 11 states:

*I guess that the initial phases of the Birmingham Scheme I didn’t give this much consideration as consumers were mainly commercial, however when we managed to get HCA funding to extend the scheme to high rise social housing bringing affordable heat to tenants, I did take a sense of personal pride in my involvement as a public servant.*

Champion 2 states, “*I saw it more as a commercial opportunity that would benefit all sectors.*” The champion’s actions were thus bound by their public sector duty which in some respects acted to control and even limit their behaviour. The ability of the champion to frame the DH initiative in a way which conveyed the public sector benefits was an important way to tap into the perceived obligations of organisational members and their duty to ‘serve the public.’ In doing so, the champions displayed altruistic or helping OCB. The DH initiatives were shown to be beneficial to the local community and the public whom they serve. The projects weren’t promoted as a purely financial or economic activity, rather the motivations were socially and environmentally rooted. This helped to create an inclination on the part of key organisational individuals to lend support, as Champion 4 states: “*DH has to be the best option for the community it is serving,*” likewise Champion 14 states: “*I was highly conscious in ensuring transparency, focusing on the outcome and working with the interests of that community in mind.*”

‘Accountability’ was a strong feature of the organisational culture, as champion 10 states: ‘*The public sector role in ensuring benefits are spread*
evenly is crucial here.’ Thus, the LA provides a unique environment for a champion; one in which accountability and public value for money act to regulate action. These values are, however, useful resources to be utilised for the forging of relational social capital through perceived obligation. Considering the traditional focus on maintaining the status quo and emphasis on public benefit, champions in the public service context may be considered as displaying strong citizenship behaviours. Their ability to go ‘above and beyond’ their official job duties (functional participation) is heightened given the constraints which potentially act to limit innovative behaviour namely, the need to ensure transparency and demonstrate public sector benefits. Likewise their ability to display advocacy participation or ‘voice’ and effectively be controversial is key to having their voices heard.

7.3.2 Cognitive Social Capital

As has been shown, in order to create acceptance of DH the champions acted to embed their initiative into existing organisational agendas. By tying DH to organisational objectives which had their own shared language, for example, ‘fuel poverty’ or ‘sustainability,’ DH was effectively legitimised through the creation of cognitive social capital. Underpinning the creation of cognitive social capital was an appeal to organisational values, which were underpinned by public sector obligations. Champion 8 stressed that DH must be packaged to be in the organisation’s interests:

*Understanding what motivates senior managers....what their key priorities are and then positioning DH as a way to help achieve them i.e. linking DH*
to tower block refurb; showing how DH can help attract companies to the city; demonstrating the return on investment etc.

Likewise, Champion 10 states, “district energy is all about linking projects for maximum community benefit. The public sector role in ensuring benefits are spread evenly is crucial here.” Champion 9 presented her DH proposals as a “Technical Solution for a Social Problem,” and tied them to the Council’s Affordable Warmth Strategy. The following section considers the tactics and attitudes employed by the participants as system building champions, enabling an appreciation of the nature of the technology being championed.

7.4 System Building Strategies

System Building Attitudes

When asked to rate the statement, "I'm comfortable with bending the rules if it means by-passing the bureaucracy," a median group score of 4 was obtained. This reinforces the notion that the champions are willing to risk their personal reputation and may be comfortable with bypassing existing organisational rules to ensure success. Although the score is relatively high collectively, one champion, Champion 4, strongly disagreed with the statement. Interestingly, this champion is the participant who is attempting to drive the DH agenda through existing policy in a policy-driven approach. Champions 6, 7 and 14 indicated they neither agreed nor disagreed with the statement.
The participants were then asked to rate the following statement, "Building support sometimes required manipulation." This was designed to dig a little deeper beneath the previous score to ascertain the willingness of the participants to adopt more subvert methods. The median value for this item is 4. However, one champion, Champion 4 strongly disagreed with this statement, closely followed by champion 8. Champion 10 neither agreed nor disagreed. Akin to the ‘system builder,’ the champion of district heating is willing to employ a host of tactics to enrol and unite relevant actors.

The participants were asked the following question, ‘Which did you attempt to gain first, cross-departmental support or senior management support?’ Eleven of the champions stated that they gained Senior Management support prior to gaining cross-departmental support. The champions thus acted rationally, within the existing organisational rule system in pursuing DH. The bureaucratic and conservative nature of the LA may necessitate a more conventional championing approach. However, Champion 11 indicated that in fact both coalition support and senior level support were in his case superfluous, suggesting that gaining the support of political members/councillors was the crucial factor:

Both of these are useless in BCC without political support. I would suggest from my observations that Councillors are much more hands on in BCC than in other LAs they call the shots! Senior management tend not to listen without the political agenda (Champion 11).

Champion 1 also stated that he was answerable to his board of Councillors.
and that for him gaining cross-departmental support was more pertinent. Champion 17 and 7 also highlighted the value of Member support. Champion 7 states, “I reported early feasibility study findings to Directors under the Corporate Sustainability Board. This then led to member briefings. Once members are on board the Council Officers get on board.” Champion 10 suggested that gaining the support of superiors was a necessary prerequisite for gaining the support of peers: “…it's then easier to get cross departmental buy in.”

System Building Strategies

The following system building strategies were pivotal to the championing attempt:

•Lobbying: Champion7: “I lobbied the GLA to gain more funding to support project development and to sit with the Council in negotiations with the major developer at the planning stage i.e. participation is not just a Camden requirement but a London one.”

•Enrolling those with the correct skill set to help of which some experts were sought from the domestic market, some from Europe: “…the CHP expert was my closest ally” (Champion 9); Champion 1, 7 and 11.

•Building a body of evidence: “I built a body of evidence and secured external funding for consultancy lead strategy documents” (Champion 5).
• Promoting the project through presentations and engaging with stakeholders: “I opened an energy shop in conjunction with the Council’s energy section” (Champion 1).

• Presenting the benefits of the opportunity: “clearly showing what the opportunity would be to the city and to the regeneration programme as well as existing businesses” (Champion 14).

• Enrolling a wide support base: “One thing I did was to talk to larger companies in Swindon who might benefit and build consensus” (Champion 10).

• Securing financing: “Funding was the main issue for us” (champion 6); “I Convinced the finance team it stacks up! Its Legal and will be an enhancement for the citizens and raise the profile of the city and you’re on to a winner” (Champion 11); “Putting finance and legal agreements in place, then finding a private sector delivery partner, the latter is essential in my opinion” (Champion 17).

• Reassuring colleagues of the appropriateness and effectives of the technology: “By raising DH as an option, reassuring colleagues that it was an appropriate and advanced technology (using the European examples) and providing information on the benefits.” (Champion 4).

• Learning/Study visits: “I visited Denmark then came back and prepared a talk for senior management. I attended seminars and then talked to others about the topic” (Champion 1); Champion 16: “It is important to visit a UK
scheme first before going abroad as the training can be very intensive, the process of learning though is an on-going one.” Champion 9 visited a UK-based DH system; Champion 17 visited a European DH scheme; Champions 10 and 11 visited UK-based systems.

•Creating appeal through ‘positioning’ DH: “Understanding what motivates senior managers, what their key priorities are and then positioning DH as a way to help achieve them. i.e. linking DH to tower block refurb; showing how DH can help attract companies to the city; demonstrating the return on investment etc.” (Champion 8). “I angled the arguments for CHP in such a way to be positive for each of the 4 political parties that have formed the administrations in Aberdeen to gain cross party support” (Champion 9).

•Not staying quiet: “Incessantly reminding everyone of the project and its objectives”

(Champion 17)

•Reassuring prospective subscriber groups that connection to the DHN would be beneficial: Champion 9 and her team would visit prospective domestic customers in their home to discuss their concerns and took them on a trip to a successful DH scheme to alleviate their concerns. Champions 9, 11 and 17 cited lower fuel bills as part of their inducement tactics.

•Using the institutional means and power at their disposal: The Planning system was used to encourage connection to existing DHN’s when possible, and the installation of a DHN for new build developments (Champions 4 and 17).
Enrolment

District heating as a complex, large-scale innovation necessitated the enrolment of a range of actors and organisations which required significant efforts to convince, persuade and reassure on the part of the champion. Champion 11 found dealing with third party contractors particularly perplexing. Quite often new build commercial properties are handled by a third party contractor responsible for the design and build elements. The contractor has a short-term perspective, focusing on the completion of the construction in a timely manner; the long-term energy solution for the building is not of primary concern. Champion 11 believes that education is key here and that the LA has a strategic role in communicating the importance of long-term energy efficiency solutions. Likewise, champion 17 also found third party contractors difficult to deal with; a great deal of discussion and convincing was required to overcome customer concerns over long-term contracts.

The planning process was also used by the system builders in Southampton as a way of encouraging developers to connect to the DHN. The Council can enter into a Section 106 agreement, also known as the ‘planning obligation,’ with a developer in order to offset the negative externalities associated with their development. A range of options can be negotiated, including connection into an existing DH network, the inclusion of an on-site stand-alone CHP system or contribution to a Low Carbon Fund. This is an example of an existing institutional mechanism that is used to support the DH scheme and is employed as a lever by system builders in order to enrol
more actors and future subscribers into the system. The CO2 and energy savings of connecting to a DH scheme were also strongly emphasised. In the case of volume house builders, the system builders used its institutional ‘weight’ and planning powers as leverage to actively enrol others into the system.

Surprisingly, the most difficult sector to convince for the formally appointed Champion 1 was the public sector; Champion 1 states that one individual on the Shetland Island Council had major reservations. Particular concerns centred on security of supply and ensuring that the DH scheme would still be operational in the future. Also of concern was the issue of whether there would be sufficient levels of waste generated, in light of increasingly stringent waste targets. In order to alleviate these concerns an energy shop was set up for residents who could come and discuss their concerns and learn a little more about what connection to a DH scheme would involve. Meetings were held and seminars were conducted in order to ‘win over’ local businesses, mainly plumbers. Early customers were also eligible for a grant.

The Health Board also proved problematic during the project beginnings; the Board took advice from consultants who claimed it would not be economically beneficial for the National Health Service (NHS) to connect. This was false and required a great deal of discussion to convince the Health Service, who did eventually connect to the scheme. The local Housing Association (HA) by contrast was extremely receptive and felt that DH tied in with their aspirations on Fuel Poverty. In addition the technology appealed due to the lack of maintenance required; there is no need for
individual boiler maintenance and servicing inspections for tenants. Interestingly, the HA gave tenants no choice about connection, simply connecting their stock to the network as a matter of course.

The domestic subscriber group at Aberdeen had real concerns over what the potential connection would involve. Worries centred on the level of disruption they would experience and the practicalities of the new system. As Champion 9 recollects, ‘Tenants had real concerns over disruption and what the new system would mean for them.’ The system-builders had to work hard to soothe these concerns. Indeed, the first block to have DH installed, Stockethill, was a ‘long and hard sell.’ Champion 9 had to effectively redefine DH, moving away from perceptions of something ‘unknown, disruptive and hard to use’ to an easy, practical and useful way to heat their homes. Particular methods to alleviate these issues included a trip to a successful UK scheme so that tenants could see for themselves how a DH system operates, and this helped to make them feel more positive about the idea of having DH themselves. ACC also set up discussion sessions in order for tenants to discuss any apprehensions that they may have. The real breakthrough in terms of enrolment came when DH was presented as a solution to the problem of high cost fuel bills: ‘The concerns over disruption were soon alleviated when tenants realised the savings that could be made on future heating bills’ (Champion 9). Pricing strategy was of key importance when successfully enrolling the subscriber group into the shared purpose of the system. The approach also placed a strong emphasis on continuity of service and of system practices; it was stressed that the new system would not create significant change in heating practices, only beneficial improvements in comfort and economic terms.
Convincing potential customers why they should connect was one of the biggest challenges for Champion 17. Furthermore, being ‘tied’ to one supplier was a particular concern for potential subscribers (Participant 10). There was also a ‘feeling of disbelief’ in Southampton that the DH scheme had not been done before (Participant 10). As in Aberdeen the meaning of DH was effectively ‘translated’ into a solution for competitive energy costs. SCC employed the tactic of assuring customers that prices would remain competitive and transparent, being tied to a basket of alternative indices which was to be reviewed on an annual basis. Concerns over maintenance and operational aspects were met with the reassuring fact that, “the National Grid has a greater level of down-time compared to district heating networks” (Participant 10). The system-builders thus used the weakness of an existing system to emphasise the strengths of DH, as Summerton (1992) notes, existing systems must be dislodged.

The champions were asked the following question, ‘What was key to your championing success?’ The following two factors emerged as highly pertinent to the championing attempt:

• **Vision/Long-term vision (for the DHN)**

• **Persistence/determination**

The importance of a long-term plan for network development was also emphasised by Participants 8 and 9, who stressed the importance of a phased approach to network development with detailed plans for the short-term solutions, medium-term options and long-term strategy. These should rest
on a demand-led approach to DH. Determination was crucial to all the system builders; much time and effort is needed to convince often very sceptical prospective subscribers. DH is an unfamiliar technology, as such the benefits, practical realities and affordability must be conveyed and often conveyed again and again.

7.5 Chapter Conclusions

This chapter has demonstrated the importance of acknowledging contingency and context in championing accounts. Critical features of the organisation and the innovation have been shown to be highly relevant to the emergence of the champion and the success of his/her endeavour. The ‘opportunity to champion’ is multidimensional; the result of complex situational factors including public sector obligations and responsibility, driven by national and local policy drivers, as well as the autonomy of individuals.

The need to address local problems including affordable warmth and FP reduction, as well as reduce carbon emissions emerged as strong motivators for organisational action. However, the way in which the LA chooses to answer these obligations are open to interpretation, herein lies the scope for ‘alternative solutions.’ In the absence of a specific district heating policy this will depend upon the initiative and drive of innovative individuals, who act to investigate, promote and implement the ‘unconventional.’

The endeavour is contingent upon the creation of organisational social
capital which provides the champion with critical resources namely, assistance, expert knowledge and legitimising support. In order to create structural, relational and cognitive social capital, the champion draws on and utilises his own human capital resources, including their organisational ‘position of power’ and helpful persona. Organisational Citizenship Behaviours (OCB’s) are also exploited, both affiliation and challenge-oriented. Relational social capital, which centres on the quality of connections is highlighted as critical, enabling the champion to benefit from connections, based on trust, likeability and perceived obligation; stronger connections engender a stronger support network. The public sector context necessitates the exploitation of ‘perceived obligation’ as a mobilising resource for action; through framing the DH initiative as the solution to a significant, often emotive organisational agenda such as FP, the champions draw on the ‘public sector duty’ of organisational members.

The opportunity for championing has also been shown to be influenced by the vested interests of external organisations and actors. In two cases, the lobbying effect from outside organisations created the need for an urgent organisational response. In Coventry local businesses felt strongly that DH should be considered, and acted to pressure the Council into investigating. In Camden, the lobbying action of the local environmental group led to the Council committing to strong carbon reduction targets. The availability of funding (internal/grant support) was highlighted as a key enabling factor which also acted to shape the opportunity to champion, supporting as it does the access to the critical resource of external DH expertise.

District heating as a technology has been shown to be an inherently local
system; although the technology itself is fundamentally the same across schemes the technological ‘style’ varies across the cases studied. The system-builders in each case have worked tirelessly in pursuit of the system goals, actively seeking to enrol others into the shared purpose of the system. Indeed, the acceptance, assistance and support of others was crucial to the system builder’s endeavours. Much like Hughes’ system builders who relied on a talented team of skilled individuals, the DH champions relied on gaining the relevant knowledge from DH experts and the support and assistance of LA colleagues. A range of tactics and methods were employed to gain the support of relevant actors, which required a significant degree of persistence, commitment and determination.

The subscriber base can be a diverse group, necessitating an approach tailored to the needs of each customer segment: domestic, commercial or public sector. Third party contractual companies proved difficult for champion 10 and 17. Economic incentives were found to be imperative for Champions 1, 5, 11 and 17, in gaining acceptance of the range of associated subscriber concerns. These included disruption, operation and maintenance of the new system, ease of use and contractual ‘lock-in.’ Effectively, a system-builder must act to ‘un-lock’ the existing system and create new, meaningful connections to the DH system. Long-term vision was vital, considering how the network will expand and incorporate different and new customer segments/markets.

The three most frequently cited challenges to system building were the need to convince stakeholders, establishing the business/finance case and the ability to counter internal resistance. Although internal resistance did not
necessarily imply deliberate acts of opposition, in some instances resistance took the form of a lack of knowledge and concerns over project impacts. As DH is a relatively unknown quantity there is a need for system builders to provide information (to explain) and help relevant stakeholders understand the concept and its potential. As such, certain aspects of social capital which took the form of values and attitudes proved to be problematic for the champions; entrenched practices and a lack of knowledge and awareness of DH presented obstacles that needed to be shaped by the human capital resources of the champion. The champion’s internal resources of persistence and determination were necessary to counter this resistance. The next chapter considers in further detail the crucial aspects of human capital.
CHAPTER 8: HUMAN CAPITAL

8.1 Introduction

The following chapter reveals the ‘why’ of champion origins through an examination of the human capital features of the participants. This provides an understanding of why certain individuals may be inclined to champion DH and also helps to explain their success in such endeavours. Firstly, an analysis is made of the educational paths chosen, the content of study and its relevance for championing DH. Previous experience of DH will then be detailed before exploring the participant’s motivations and personal drivers. An examination of the participant’s career history is conducted, exploring the champion-relevant skills and experiences gained, prior to considering the results of the BFI personality assessment.

8.2 Educational Routes

Table 8.1 summarises the educational routes taken by the champions, including Higher Education (HE) establishments and Further Education (FE) colleges. Following this a more detailed explanation of the educational path taken by each champion is provided. An examination of educational attainment enables a relative appreciation of the cognitive ability of the participants, as well as the possibility of a prior knowledge of DH, which may have inclined them to champion the technology.
<table>
<thead>
<tr>
<th>Champion</th>
<th>Attended a Higher Education (HE) Establishment</th>
<th>Attended a Further Education (FE) Establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Civil Engineering (BSc)</td>
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<tr>
<td>2</td>
<td>Building Surveyor (BSc)</td>
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</tr>
<tr>
<td>3</td>
<td>Building Services Engineering (BEng)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Geography</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Applied Biology (BSc) Environmental Technology (MSc) Fuel Poverty DH (PhD)</td>
<td>GCE A levels, chemistry, physics, biology. Scottish Business Education Council (SCOTBEC) PG Diploma Administration- DIA</td>
</tr>
<tr>
<td>6</td>
<td>Biochemistry (BSc)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environment, Creative Writing, Open University (BA)</td>
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<tr>
<td>7</td>
<td>Economics, (BSc)</td>
<td></td>
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<td></td>
<td>Urban Design (MSc)</td>
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<td>8</td>
<td>Geography, (BSc)</td>
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<td></td>
<td>Climate Change &amp; Sustainable Development, (MSc)</td>
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<tr>
<td>9</td>
<td>Social Science &amp; Technology, Open University.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Town &amp; Country Planning, (BA)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Combined Studies, Management and Communication</td>
<td>CGLI Construction Services (HVAC)</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>HNC Mechanical Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ONC Mechanical Engineering</td>
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<tr>
<td>13</td>
<td></td>
<td>Accountancy</td>
</tr>
<tr>
<td>14</td>
<td>Environmental Science &amp; Geography</td>
<td>Environmental Science; English Literature; Geography</td>
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<tr>
<td>15</td>
<td>Geology &amp; Geography (BSc)</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>ONC Building Services &amp; HNC Building Service</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Management Studies</td>
<td>Accountancy</td>
</tr>
</tbody>
</table>
All champions have achieved a good standard of education indicating a fairly high cognitive ability useful for dealing with the complexities of championing an LTS. There is also an emphasis amongst the participants on continued learning and development. Although, only two champions have actually studied DH and not in an in-depth manner. Indeed, none of the champions can be considered as ‘experts’ of DH in the sense of a strong prior knowledge.

Only two champions have studied DH in any formal capacity; champion 7 studied DH as part of his diploma in Urban Design and Champion 9 studied DH as part of the Technology foundation module of her Open University degree. In her own words she left school at 16: “a bit wild,” then studied with the Open University for 6 years on a part-time basis (Social Science and Technology); “I didn’t study to progress I did what I enjoyed.” Champion 9 lived in Scandinavia for a year working for an oil company where, “DH was the norm.” She left this role to work in Orkney as a sole trader providing advice on planning and development for community care homes. Discussing the career change she states, “…many skills are transferrable.” Champion 9’s path into the Council began as a Home Energy Conservation Act (HECA) Officer; at the time a position created in association with the Home Energy Conservation Act.

Champion 6 studied biochemistry at Manchester University, though she states: “I only did biochemistry as I didn’t get into medical school.” Champion 6 went on to undertake a diploma in Administration at a FE college before joining the LA. In 2009, she studied for a BA at the Open University: “It was an open degree you pick and mix what you like,” studying Climate Change, Environmental Policy & Energy and Creative Writing. Her route into the LA and eventual progression to her current
position was her attainment of a Diploma in Administration. Although, Champion 6 did not set out with the intention of pursing an environmental career, she is driven by a desire to “make a real difference.”

Champion 5 originally studied Applied Biology before progressing to study Environmental Technology, he is the only participant to embark on a PhD programme. His research examines the potential for DH to alleviate FP; he embarked on his doctorate studies after investigating DH through his work role.

Three of the champions studied finance/economics. Champion 7 studied for a BSc in Economics at the London School of Economics (LSE) but his interest in architecture led him to work with a property developer and architect in London in the late 1990s and early 2000s. During this position he studied for a Master’s degree in Urban Design which he completed on a day release basis. His thesis examined sustainability in the Kings Cross area of London and he notes that “it is good to have developed the DH project in the area!” This enabled Champion 7 to gain considerable experience in property development and property law but in his own words he, “wasn’t totally happy with the work.” He was interested in sustainability and, upon seeing an advertisement for a job with an environmental charity, he took the opportunity. This position involved managing the charity’s property portfolio and developing an eco-housing scheme in Sheffield: “I joined them, refinanced their property assets to buy them some more time and delivered the housing scheme.” He also studied for a Royal Institution of Chartered Surveyors (RICS) accredited Postgraduate (PG) Diploma in Sustainable Design and Construction, which involved a small element of DH study. Following
that post Champion 7 worked for another charitable organisation, BioRegional (a sustainability charity). This involved working on the sustainability strategy for the London Olympics 2012 which incidentally involved the installation of a DNN for the site: “I’ve learnt a lot about sustainable design and construction on the job.” In spite of a lack of formal qualifications in sustainability/engineering/the environment, Champion 7, by his own recognition, has learnt whilst, “on the job.” It would seem that Champion 7 used each new position as a learning opportunity, gaining new skills and qualifications in the areas that interested him.

Champion 13 is the 2nd champion with a finance background and he is also the participant whose path career and life, is arguably least conventional. He wanted to go to University to study Psychology: “I like to people watch.” At the time, however, his Father refused to give permission for him to go to University, which led to great disagreement within the Family and led to Champion 13 leaving the Family home at the age of 18. After leaving home he lived in a hotel for the next 2 years whilst also working there on a part-time basis. By chance a group of accountants were staying at the hotel and after befriending them he was presented with two job offers; one position would have involved working for the private sector which would have meant paying for his own training, whilst the public sector position offered free training whilst working. Champion 13 opted for the free training option and took the job with the public sector, working on a day-release basis to complete his accountancy qualifications. Champion 13 rose to be the Director of Finance for his current LA then remarkably Chief Executive, a position he holds to this day. Much like champion 13, Champion 2 was also attracted to the public sector as it meant that the LA would fund his 5 year
part-time degree in Buildings Surveying.

Like Champion 13, Champion 17 also held the position of Director of Finance during his career at Southampton City Council. Akin to champion 13, he was also prevented from attending University by family circumstances. At the age of 16, Champion 17’s Father became seriously injured which led to him becoming a carer supporting his Mother. This meant he was unable to attend University and instead studied accountancy via block release. Later on he obtained a Diploma in Management studies at Teeside University.

Generalists or Specialists?

Engineering/technical knowledge was deemed an important skill for four of the champions, with champion 12 siting it as imperative, “Technical knowledge is the essential starting point.” Strong communication however, was the most frequently sited skill required (by 6 champions). Management/leadership skills and finance/business acumen scored slightly higher with 5 champions stating each skill set as significant. As Champion 11 stresses:

Leadership was key, making those project team members buy into the common agenda and constantly reverting and explaining the 'win win' elements that the DE would deliver for all stakeholders.

Champion 16 asserts, “....you must have the ability to express yourself to others, be able engage others.” Similarly champion 9 states as relevant:
The ability to work with a wide range of different people/disciplines (e.g. elected members, Council officials, volunteer board members of the independent company, CHP Engineer, procurement staff, contractors, funders, occupants of the homes which are having the new heating installed, etc.

Three is also a strong emphasis on a team effort: “... infusing the 'team' with the same vision that you have provides a sounding board when working through ideas” (champion 12). Likewise, Champion 11 emphasises the importance of instilling belief in the project goal: “...making those project team members buy into the common agenda and constantly reverting and explaining the 'win win' elements that the DE would deliver for all stakeholders.” This suggests that DH champions do not view themselves as lone pioneers or organisational renegades, rather they view themselves as an integral part of a team effort.

Champion 17 supports this assertion, emphasising the importance of “giving credit to the team and politicians.” As does Champion 1, who stressed the importance of uniting those with differing agendas.

Champion 16 stressed the importance of both a sound technical knowledge and the ability to communicate with higher level organisational members: “You need to have a good knowledge of how a system works, be able to understand the hydraulics of systems and be able to talk and engage with those higher up in the organisation.”

Champion 4, who is pursuing a policy-driven approach to DH, was the only champion to emphasise the need for a strong policy background.

Champion 5 stressed a problem-solving orientation as important: “The ability to deal with complex problems and identify deliverable solutions.”
It could be argued that for those who have studied technical/engineering-based degrees, the technicalities of DH systems may be more easily grasped. However, the ability to champion DH is not contingent on the achievement of a theoretical knowledge in DH or indeed an engineering-based discipline. The following section considers the extent to which the participants have developed a practical or working knowledge of DH, or have any ‘experience’ of DH, which may have influenced their propensity to champion the technology.

8.3 Previous Experience of DH

Given that DH is not a common heating system in the UK, efforts were made to understand the extent to which the participants had prior awareness/experience of DH or had developed a practical knowledge of DH that may have affected their decision to champion. Six of the participants had previous experience of DH; two had during their working lives been involved with early DH systems through their roles in Building Services Management. As Champion 3 explains: “I had experience of large steam distribution systems on large hospital sites. I also had experience of large medium temperature hot water distribution systems also on hospital sites.” Similarly, Champion 16 states: “When I started in Building Services in the early 80's I did a lot of projects in hospitals and universities taking out there large centralised Steam Boilers and replacing them with local boilers in each building. So this in some cases is like going back in time.”

Both champions had some working knowledge of DH on large sites,
where an energy centre will typically feed heat to a number of buildings via a heat network. However, neither champions had experience of a large-scale, mixed-use DHN of the scale typically associated with city-wide DH projects.

Champion 2 had also gained some experience of DH, having previously developed a feasibility for an extension of an existing DHN, during his earlier position at a LA. At the time of the study, energy costs meant that the plans were not economically viable. However, since Champion 2 left the Authority the report was revisited and put into action, and it would appear that he played a pivotal role in expansion of this DH scheme: “I was the catalyst for the extension of the scheme.” Champion 14 had been a customer of DH in his previous role as an Environmental Manager at a University that is the largest customer of DH in the city of Sheffield. Champion 9 had also been a DH customer, when she lived and worked in Scandinavia where DH is the “norm.”

Six of the participants had thus some concept of DH whilst the remainder of the group had had no prior experience of DH. There were no defining experiences or prior knowledge that led them to consider DH as particularly exceptional; they didn’t appear to have a bias towards the technology. The participants had limited theoretical knowledge and also limited practical experience of DH, thus reinforcing the idea that like the System Builder, they could be considered as generalists rather than specialists. The next section considers the personal motivations and career goals of the champions and how these may have influenced their propensity to become involved in championing DH.
8.4 Champion Motivation

Table 8.2 (Appendix D) details the career motivations of the champions, the nature of the motivation and the stated reasons for taking up a position in the public sector.

As can be seen from Table 8.2, the career drivers of the participants can broadly be categorised as altruistic or environmentally orientated, with some also expressing a desire to ‘serve the public.’ Champion 12 enjoys being in a position of authority and taking the lead, although, he also wishes to “make a difference to the local community.” Likewise, Champion 17 expressed ambitions to progress through the LA hierarchy, but also voiced a desire to create social and environmental benefits. Champion 16 emphasised his problem-solving inclination and stressed more pragmatic reasons for taking up his public sector position. Champions 2 and 11 indicated a preference for a ‘challenge;’ Champion 2 enjoys establishing project viability and champion 11 seeks to be stimulated professionally. Interestingly, only one champion, champion 7 has specifically linked his working life drivers to his personal life/family: “…having enough money to retire and enjoy myself outside of work.” Champion 9 and Champion 13, by contrast, expressly deny any monetary motivations.

Champion 13 is especially passionate about this issue, stating how his desire to ensure social fairness was a huge driver for the establishment of the non-profit ESCo’s in Woking. Champion 13 feels so strongly about this issue that he often refuses expenses for international travel and has donated his speaker fees to charity in the past. The early life experiences of Champion 13, particularly his family’s overemphasis on the value of
money, have come to shape his professional life, influencing the decisions and choices made in his role as champion.

The personal motivations and career drivers of the champions have a strong bearing on the propensity of these individuals to champion district heating. The appeal of DH lies in the ability of the champion to present the technology as a solution to a social or environmental problem. The potential for DH to deliver environmental and social benefits, including affordable warmth and carbon savings, appeals to the altruistic tendencies, as well as the challenge-oriented or problem-solving motivations of the champions in some case. DH effectively enables the participant to satisfy their personal motivations and provides, in part, an explanation as to why certain individuals may be enthused to become involved in championing DH specifically. The next section considers the extent to which organizational incentive or reward may have provided a motivating factor for champion action.

8.4.1 Reward & Recognition

The champions were each asked whether they had received any formal recognition for their role in advancing the DH agenda. A number of the champions have been recognised by national industry bodies, including the UK DEA (the UK DE Association). Champion 12 won 1st prize in the Ashden Awards for Sustainable Energy (2006) and was a finalist in the Public Servant of the Year (2007). Champion 13 was awarded an OBE for his extensive championing work and is invited as a speaker to national and international events. Champion 11 was put forward for
commendation by his colleagues on two occasions; for Dynamic Leadership and Innovative Teamwork, and for Local Government Association Council Worker of the Year (which he won in 2010 for the Green Award).

Champion 9 received awards but, interestingly and tactically, found it “more useful” to send others such as elected members: “that’s not my drop anyway.” Champion 1 is widely recognised in the UK DH community as a leading authority on DH and has also received awards from national bodies. Six of the champions stated that they had received no recognition from the LA or any other body. One champion cited that he received ‘verbal recognition’ (Champion 11). Champion 15 states that he has received recognition for his work from the Directors and Heads of Service. Champion 8 stated that he was generally well received internally, particularly by the Director of Environment and Executive Member for Environment. Likewise, Champion 15 noted that he received recognition from the Directors and Heads of Service, and Champion 17 stated that he had received recognition from the Council, as well as Government departments. Many of the champions are widely recognised in the DH industry as leading authorities; in some instances gratitude and respect has been expressed by senior organisational figures, whilst for others the recognition of their contributions has been acknowledged nationally and internationally. Crucially there were no formal incentives for championing DH; the participants were not induced to act by the promise of an organisational reward. Although, a personal sense of pride in their DH accomplishments is felt acutely, the champions tended to emphasise the social or environmental rewards above any personal benefits.
Champion 11 states: “From a personal learning experience it was amazing and coincided with me completing a part time MBA. I have since been promoted twice.” Likewise, Champion 6 declares that, “the benefit of low-cost heat to many poor tenants has made it worth it.” Champion 1 states:

It's one of the most exciting, transformative projects I've ever been involved with and could leave a lasting legacy in the city,”….. Although I feel I have done some great things in other works such as water DH has got me the greatest recognition both in Shetland, UK and wider afield.

Champion 9 does, however, hint at some personal cost to championing, “I am pleased with the progress so far. But it took a tremendous amount of my time and effort .....I used to call CHP 'my Saturday job' - to get everything done that was needed took far longer than the hours I was employed to work.” Likewise, Champion 7 wished he could have delegated more.

8.4.2 Altruistic Tendencies: Charitable Behaviour

The champions’ altruistic motivations were also evidenced by their charitable behaviour. The champions were asked if they had ever supported, or currently support, any community or charity initiatives. Only one champion, Champion 12 stated no. The remaining 13 participants stated yes. Champion 9 states, “I always have in both time and money;” champion 11 declares: “I am a treasurer for a local branch of a charitable organisation. I also support Christian aid week,
delivering and collecting envelopes door to door in my local area.” Champion 10 lists his charitable endeavours: “Teaching English in Ecuador, PLAN child sponsorship, NSPCC, ad hoc appeals.” Champion 9 is very active in her local community, joking that “now I’m retired I only work 3-4 days a week!” She is the Chair of the Local Housing Association, is on an advisory board for financial inclusion in the city, and is an advisor to Care and Repair as well as sitting on an expert panel for DH in Scotland (as is Champion 1). Champion 3 has been a volunteer first aider with St Andrews First Aid for approximately 20 years: “We provide first aid services at community events across Scotland – similar to St Johns Ambulance in England. Until last summer I was also the chair of the organisations executive committee for central Scotland. I did that for about 4 years.” The participants have all (apart from Champion 12) shown a willingness to devote time and effort to charitable concerns, either presently or during the past, displaying a ‘generosity of spirit.’

8.5 Career History

The following section details the career experiences of the champions. Table 8.3 (Appendix D) shows the types of sectors in which the participants have been employed, and the skills and experiences gained during previous positions. The various career paths have enabled the champions to develop skills and gain experiences that are useful in their championing roles.

The participants had during their working life prior to their championing role, amassed skills and experiences that were of direct benefit to their role in championing a large-scale, multi-stakeholder DH agenda at their respective Local Authorities. Many champions had gained an
understanding of environmental/sustainability issues and had variously
gained Project Management experience and managerial/leaderships
skills. In addition, the willingness to go outside of their comfort zone
was evident for some of the champions with three Champions (1, 9 &
10) choosing to live and work overseas despite this being a difficult
experience for some. As Champion 9 states, “I hated the job, but I need
an income.” Champion 10 has also spent time working abroad. He started
his career as a Planning Officer for a local Council, he then took a position
with an International children’s charity which involved working as an
English Teacher in Ecuador an experience he relished:

*I always wanted to travel – had lots of missionaries traipsing through
our house growing up, and I wanted to see the world. Fascinated with
South America so went there! Life changing experience to see the
challenges some people face and in your face inequality and racism.*

Upon returning from his time abroad, Champion 10 took a Senior
Planner position at Swindon Borough Council where he worked for 9
years. He was promoted in 2012 to Sustainability Manager for the LA, a
position which he held for almost 2 years. When the LA established a
direct labour company in order to deliver innovation solutions in the area
of waste, power and heat, Champion 10 became an Account Manager.
The company originally had a fairly wide service remit including
highways maintenance and the constructions of new schools. It has since
refocused on the ‘niche green energy markets,’ specifically on waste
treatment and disposal, PV installations and large scale-arrays. He is now
the Head of Power Solutions as of January 2015.

In 1979, Champion 1 took a position in Papua New Guinea where he was
based in Port Moresby, although he travelled extensively to develop water projects in the region. He found his time abroad to have been a hugely enriching experience, both professionally and personally, and gained valuable know-how in developing innovative water and drainage systems. In doing so, it is apparent that Champion 1 is unafraid of upsetting the status quo:

*I never regretted going although I fell out with the upper levels of management (mainly Aussie civil servants)....They tried to persuade me to stay by setting up a separate water authority (which did happen) but I felt I had had enough and they were quite keen to get me back to Shetland.*

This is also evident when later in his career he was responsible for developing an education capital programme when working for the Department of Design and Technical Services: *“The programme was in chaos and I managed to reorganise it making it realistic and cutting costs although the architects were not too happy.”*

Through building up a significant practical knowledge of biomass systems during his time as a Principal Designer and Energy Engineer, Champion 12’s expertise was in strong demand from organisations across the UK: *“I’m supposed to be the country’s leading expert!”* As champion 12 was spending more and more time away from the LA he decided to leave and set up his own company. As of 2009, he established his own consultancy and now works for the Council on a freelance basis.

Champion 13 has perhaps the most unconventional and remarkable of career paths. His family owned their own agricultural business and he
was used to working long hours, something he credits with instilling him with a strong work ethic: “I was bought up with the thinking that there is 24 hours in a day and you make use of them.” Having left home at 18 following a family dispute in which his Father refused to let him attend University, he lived in a hotel for 2 years where he worked part-time. Upon meeting a group of accountants who were staying at the hotel, he received two job offers, one for the private sector that would have meant that he would have had to pay for his own education, and one for the public sector that involved free training. He opted for the public sector position and began his workplace training in accountancy: “I was always good at numbers.” He then joined Woking Borough Council in 1989 as a Director of Finance and rose to become Chief Executive in 2006. Champion 13’s early family experiences have shaped his career choices and his family’s dogmatic belief in money: “it goes back to my childhood’ money was a big issue, profit was what it was all about, now I don’t care at all about it, that’s why I set up these non-profit ESCo’s to give back to the local community.” Champion 11 also indicates that contact with overseas Ministers during his childhood influenced his decision to take a position abroad with an overseas charity.

Champion’s 5 and 4 both had first-hand experience during their careers of the social effects of poor heating systems. Champion 4 has worked in the charitable and voluntary sector, his role in community development involved providing welfare-rights advice to tenants on a Council housing estate. He then took a position with the National Energy Action (NEA) charity, dealing with Fuel Poverty issues. His work in the public sector began with providing evidence to the public health department on the impacts of FP and cold homes for the Housing department. He then progressed to his current position as Principal Officer for Low Carbon
Projects, which involves working closely with the Policy Team on producing an Island Plan (the Council’s Core Strategy). Champion 5’s previous work delivering innovative solutions to households in FP, as well as his own family’s experience of FP, has had a lasting effect: “These living conditions are not just unpleasant but have chronic and acute impacts on health, limit people’s live outputs and potentials” (Champion 5). It is unsurprising, therefore, that Champion 5 feels passionately about the need to tackle FP issues and was moved to investigate the potential for DH to assist in the fight against FP academically.

Champion 6 is the only participant who has spent her entire career thus far at the same LA. She joined the LA in 1986 as an Area Housing Assistant and has since progressed through promotion and secondments to her current position as Programme Development Officer. This has enabled Champion 6 to develop a sound understanding of the workings of Local Government and she has developed an expert knowledge on Housing and Energy Efficiency matters. This meant Champion 6 was well-placed, via her knowledge and network of connections, to capitalise on the opportunity for implementing DH.

Champion 2 also has significant LA experience, with over 25 years’ experience as a Building Surveyor. He began his career as a Project Manager for Birmingham City Council, he was attracted to the position as it enabled him to work and study at the same time, allowing him to complete his qualification in Building Surveying. His position involved working on the capital works programme for the city’s museum:

I managed an improvement programme that saw the Birmingham Museums transformed for the first template in decades. Under my watch
I oversaw and project managed major schemes at Birmingham Town Hall, Aston Hall, Blakesley Hall, Soho House, the Jewellery Quarter Museum, the Museum Collections Centre, the Waterhall Modern Art Gallery and several galleries in the main museum.

He joined Coventry Council in 2004 when he responded to an advert for a ‘Project Champion of Regeneration.’ He had the responsibility for a significant amount of funding in developing the city’s regeneration aspirations. Champion 2 is the only participant in the study to have held an official title of ‘Champion’ during his/her career. Following this position, he was promoted to Head of Sustainability and Community Programmes. He left the LA in 2011: “I left when I felt I could progress no further within the LA and I had always wanted to set up my own business.” Champion 2 had developed considerable expertise in project management before he took his championing role. This, coupled with the ability to gain external funding, is what champion 2 believes led him to be successful in landing his LA position. Since leaving the LA, Champion 2 has established a number of companies offering services including coaching and mentoring, building surveying and community recycling. Indeed, a number of the champions have established their own business ventures.
8.5.1 Entrepreneurial

Interestingly, seven of the champions have established their own business ventures during their careers; although the nature and scale of the operations, as well as the motivations for doing so vary. Champion 2 he felt he could progress no further within the LA and had always wanted to set up his own business. By contrast, Champion 4 owned a worker’s cooperative retailing organic fruit and vegetables: “We grew and retailed organic fruit and veg at a site north of Newcastle.”

Champion 12 had, in fact, always valued the long-term security afforded by a LA position but left when demand for his expertise became too great. Through building up a significant practical knowledge of biomass systems, Champion 12’s expertise was in strong demand from organisations across the UK: “I’m supposed to be the country’s leading expert!” As Champion 12 was spending more and more time away from the LA he decided to leave and set up his own company. As of 2009, he established his own consultancy and now works for the Council on a freelance basis. He states, “I haven’t looked back, no regrets no bureaucracy or pointless meetings, I can get on with engineering which is what I love.”

Champion 9 was a sole trader prior to her LA position, providing independent advice on the planning and development of care homes, whilst Champion 7 established a property development/investment business. Champion 14 was a self-employed environmental consultant and Champion 11 was self-employed, though in his own words, “this was a necessity to gain employment rather than a strategic decision on my behalf!” He stressed that he generally prefers the security of long-
term employment, akin to champion 12. Champion 13 would consider establishing his own business in the future upon retiring.

Thus, a number of the champions appear to possess an ‘entrepreneurial spirit,’ the following section examines the entrepreneurial tendencies that were discussed in Chapter 2.

**Risk-taking behaviour**

The champions were asked to rate the extent to which they agree with the statement, "I am willing to put my personal reputation at risk if I believe strongly in a project." The participants could rate their preference on a scale of 1-5; 1: strongly disagree, 5: strongly agree. The median score for the participants was 4, suggesting a strong willingness to incur personal risk in a workplace setting. The highest score of 5 indicating strong agreement with the statement is given by just under half of the group, whilst the lowest score given was 2, by Champion 2. Champion 9 was clear on her attitude to risk: "I was a maverick in the LA, I didn't need the LA for employment, I could get a job elsewhere-Back me or sack me." Both female participants scored the willingness to accept personal risk item highly (Champion 9:5; Champion 6:4).

**Dislike of Routine Work**

Interestingly, when asked to rate their preference for routine work, the median score was 1, indicating a strong inclination for work ‘outside of
the norm.’ When asked to rate their agreement with the statement, ‘I see myself as someone who makes plans and follows through with them,’ the median score for the group was 4.5, displaying a strong preference for taking responsibility for decisions. These entrepreneurial tendencies can help to understand their propensity to champion. The innovative nature of DH may appeal to the risk-taking inclination of the champions, and their dislike of routine work may incline them towards engagement in organisational activities that lie outside of the scope of their defined work responsibilities. The next section considers the role of personality as a critical human capital feature and resource for the champion of DH.

8.6 Personality Features

8.6.1 Descriptive Statistics

Table 8.4 presents the summary statistics for the BFI test which 15 of the participants completed. Scale scores were created by averaging the items for each Big 5 (B5) domain. Table 8.5 displays the individual results across the Big 5 traits: Ch=Champion, C=Conscientiousness, A=Agreeableness, N=Neuroticism, E=Extroversion, Openness.
Table 8.4: Summary statistics: scale scores

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<th>Mean</th>
<th>S.D.</th>
<th>Minimum</th>
<th>Maximum</th>
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<td>4.78</td>
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<tr>
<td>Neuroticism</td>
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<td>.57799</td>
<td>1.25</td>
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**Table 8.5: Individual BFI scores**

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8.6.2 Agreeableness

From Table 8.4 it can be seen that Agreeableness scored the highest mean score for the group (4.10), followed closely by Openness (4.09), then by Conscientiousness (4.07), Extraversion (3.77) and Neuroticism (2.08). The standard deviation from the means (S.D.) are, on the whole, relatively low. The Agreeableness, Openness and Conscientiousness traits respectively had the lowest S.D and within group variance. Table 8.5 shows some variance within the group; the highest S.D score is for Extraversion (0.65); this factor also has the greatest range at 2.25. Assessing the minimum and maximum scores amongst the participants, shows that the lowest score for this factor is 2.38 whilst the highest score is 4.63.

The high scores in Agreeableness (which is associated with altruism; cooperation, warmth and compassion) are supported by the qualitative findings and in particular the motivations of the champions detailed in Section 8.4. For example, Champion 1 states: “Leaving a legacy of works that I felt have contributed to improving the lives of people,” Champion 4 declares he wishes to, “….make a difference” (Champion 4) and Champion 14 expresses a desire to, “do the right thing.” Champion 5 states:

I do not buy into the demonization of the poor so prevalent in the popular press and believe that through circumstance so many households find themselves in these dreadful situations. It is our moral duty to protect and support the less fortunate without judgment.

Champion 5 is passionate about minimising the impacts of FP and is an
extremely compassionate individual: “It is morally abhorrent that people in a developed and relatively rich country should live in such appalling conditions.” However, his Agreeableness score was 4.00; not the highest score in the group but still relatively high, this could be due to his stubbornness (Costa and McCrae, 1992), as Champion 5 stressed the importance of ‘pig obstinacy’ in driving forward the DH agenda.

Likewise, Champion 9 had a relatively low Agreeableness score of 3.89, which correlates with the interview findings that Champion 9 is perhaps a little stubborn: “Back me or sack me.” Although, the motivations for her DH system and her personal motivations were very much altruistic, alleviating the significant problem of FP amongst Council tenants: “a technical Solution for a social problem” (Champion 9).

The highest score for Agreeableness was possessed by Champion 12, this was consistent with the interview findings, for example when discussing his awards he displayed modesty: “it’s not me putting myself forward its other people putting me forward!” Champion 12 also appeared straight-forward: “Look we’re not putting rockets into space here.” He also scored highly in Openness (4.30); in his interview he discussed how he was different in comparison to his colleagues, being more likely to engage in innovative behaviour unconventional, he also developed a number of innovative engineering solutions during his career.

The high Agreeableness scores are useful in understanding why the participants were inclined to champion district heating. DH as a community solution may appeal to the compassionate nature of the champions who have displayed relatively strong altruistic tendencies and
community mindedness. Indeed in many cases DH is seen as a solution to the significant social problem of FP or as Champion 9 states, “A technical solution to a social problem.” Interestingly, the participant who scored the lowest in Agreeableness (3.67) also rated the statement, "We as citizens have a moral duty to protect those in society who are less fortunate than ourselves," lowest, scoring a 2. Champion 2 also scored the lowest of the group in Conscientiousness (3.22); as Champion 2 states: “I get my kicks up to the point of delivery of a project...” He stated a preference for moving on to the next big project. This would tie in with his relatively low conscientiousness score, which is associated with perseverance in endeavours.

Agreeableness may also be a useful trait for champions who need to gain the support and assistance of others as these individuals may be perceived as warm and eager to help others, potentially making others in turn more inclined to help them. Champion 7 stated that empathy was relevant to the role, suggesting that the ability to show understanding to other key stakeholders, namely prospective subscriber groups was important to gaining support.

8.6.3 Openness

Champions can often been viewed as unconventional, the strong Openness score maybe indicative of the tendency amongst the group to set themselves apart from their fellow ‘municipal workers’ by introducing original, innovative solutions. (Champion 9).
Openness is also associated with a strong need for change; DH is a radical departure from the existing system and the status-quo. Champion 9 scored highly in Openness: “I was a maverick in the LA, generally LA’s are stuffed full of ‘Municipal workers, I can’t do that!! They plod away never willing to put their head above the parapet.” Likewise, Champion 13 states: “I’m a Maverick, (I’m off the wall) to be honest, I’ve always struggled to fit in with my peer group, doesn’t fit the mould, doesn’t want to fit the mould, I just want to be me” and “I just do different.” The participant who scored the lowest in openness is the champion who is following a policy-driven approach to DH development. Champion 4 is placing the onus on developers in the area to instigate DH rather than the LA actually system building itself, which could in one sense be argued as a more conventional, less radical approach than the other participants. Openness as a trait, is also associated with a strong capacity for interpreting and adapting to the perspectives of others, which is critical for system builders who must enrol a wider range of actors with competing agendas.

Interestingly, Champion 5, who has achieved the highest level of formal education amongst the group, scored highest in Openness. Indeed, his PhD is considering novel solutions to FP through the use of DH which arguably necessitates an inquiring, innovative approach. He also displays a strong need for change: “Those of us in a position of influence or control have a responsibility to minimise exclusion in any form within our communities, between them and through the generations to come.”

### 8.6.4 Extraversion
For the group as a whole, the Extraversion score (associated with enthusiasm, excitement-seeking and assertiveness etc.) was fairly low, although as discussed, the S.D score was relatively high which suggests some variance within the group. It is interesting that the Extraversion scores were relatively low (3.77) for the group as a whole when championing is associated with enthusiasm, assertiveness and an optimistic disposition. Three champions displayed a particularly adventurous spirit by working abroad, (Champions 1, 9 and 10). Champion 9’s Extraversion score of 4.50 would seem to correlate with this assertion whilst Champion’s 1 and 10 had modest Extraversion scores of 3.67 and 3.75 respectively. Interestingly, Champion 11 who expressed the need for ‘workplace stimulation’ and stated he often gets bored easily, professing a desire to be challenged, had one of the highest Extraversion scores (4.50). On the whole, however, the low extraversion scores would seem to suggest that the champions are not thrill or excitement-seekers in their championing endeavours. The champions’ personal drivers, altruistic tendencies and agreeable natures indicate that the participants were moved to action by deeper rooted motivations.

8.6.5 Conscientiousness

Interestingly, both female champions scored the two highest levels of conscientiousness (associated with achievement, competence, strong-will and perseverance) in the group. Champion 9’s Conscientiousness score was in fact the highest of the group (4.78), this again is consistent with the interview data in which Champion 9 appeared extremely strong-willed (“Back me or sack me”), achievement-orientated, (“I’ve championed a range of things,”), and competent: “...
barriers, certain people, but then they just left me to it, there will always be people who won’t agree with you... just get on with it.” Champions 6, 7, 8 and 9 likewise indicated persistence as important as quoted by Champion 7: “You need strong negotiation skills and persistence/resilience in the face of challenge.”

8.6.6 Neuroticism

Neuroticism had the lowest group and individual score, which is unsurprising given the associated characteristics of tension, anxiety and irritability etc. Indeed, the ability to stay calm and focused is vital to championing given the need to convince many different actors with varying agendas and concerns. Champion 1 expressed the importance of a calm attitude: “A hippy attitude of not letting things get you down as tomorrow is another day and it is often the case a day or two later things work out.” Likewise, Champion 11 stated, “a can do attitude and real desire to succeed was imperative, even in the face of intense opposition at the time.”

8.7 Chapter Conclusions

This section has revealed the host of human capital features that explain both the propensity of certain individuals to become involved in championing and their success in such endeavours. The BFI test has shown that the champions possess relatively high levels of Agreeableness, Openness and Conscientiousness. The positive qualities associated with these
traits are valuable champion resources. The ability to mobilise support for organisational change may be supported by aspects of an agreeable persona, which may be useful in strengthening relational social capital, engendering as it does feelings of trust and likeability between employees.

Neuroticism was the least prevalent trait for the group, indicating the importance of a calm, emotionally stable nature with a low susceptibility to anxiety/shyness. The low extraversion scores would suggest that the champions are not thrill-seekers and are involved in championing by an intrinsic need for excitement. Rather their high agreeableness scores, coupled with their altruistic motivations and personal values, indicate a more deep-rooted inclination for championing. None of the participants were induced to act through an organisational incentive; some recognition did follow their championing endeavours although, the degree of acknowledgement varied. As such, the extent to which one could ‘stimulate’ championing activity in this context is uncertain.

The participants have all obtained a good standard of education, indicating a relatively high cognitive ability that is necessary given the significant demands of championing a large-scale complex innovation. The content of study however, appeared less significant; six of the champions studied technical/engineering-based degrees, which it could be argued, enable them to more easily grasp the technicalities of DH systems. However, the range of subjects (Biochemistry, Planning) suggest that a technical knowledge base is not vital to championing DH. Therefore, gaining access to expert knowledge and plugging their own knowledge gap may be critical for successful championing attempts. Some of the participants have had experience of DH previously, either through a previous work position or in the case of two champions, by studying DH.
Two champions have also been customers of a DH network. Aside from these relatively ‘light’ connections with the technology, the champions showed no prior bias or inclination to the technology itself, suggesting that important contextual factors influenced the technology choice.

The skills and experiences gained during the participants working lives, including a broad working knowledge of sustainability issues and project management, have been shown to be of relevance. Indeed, the champions emphasised the importance of communication, leadership and business skills. Generally, the participants had worked in other organisations developing their knowledge and expertise with environmental issues/FP/engineering. Seven of the champions have established their own business venture during their careers. Coupled with their attitudes on routine work, risk-taking and decision-making in general, it would seem to suggest that the participants share some entrepreneurial qualities. These entrepreneurial tendencies may incline them towards engagement with innovative activities that involve a certain degree of risk, and which are outside of their defined work responsibilities. For three of the champions, family background played a role in influencing their education/career paths and the choices made during their working lives.

8.8 Conceptual Model

The findings from the empirical chapters 7 and 8 have been synthesised into a conceptual model.

Figure 8.1 reveals the interaction between the critical human, and (organisational) social capital features of the Local Authority Champion of 280
district heating, as well as the contextual factors which influence the Championing attempt.

Considering the theoretical framework developed in Chapter 5 (Figure 5.1), which highlights the relationships in the existing body of literature, Championing is shown to be a confluence of both structure and action (Markusson, 2010). However, this study has uncovered the personality profile of the Champion of district heating and emphasized its criticality as an inherent human capital resource for the Championing of change, influencing both the propensity to Champion and the success of such endeavours. The Champion of district heating, whilst demonstrating enterprising inclinations, is found to have strong altruistic tendencies, revealed by high levels of Agreeableness and motivations rooted in social and environmental concern. The study has also demonstrated the continued relevance of the notion of a ‘System Builder’ in modern district heating contexts; still a powerful agent of change, constrained and shaped by context and supported by critical organisational resources. As described in the literature and displayed in Figure 5.1, DH as an LTS is both socially shaping and socially shaped, this imposes unique challenges on the Champion of DH, as detailed in Figure 8.1, these include the need to understand complex business and contractual models, significant upfront investment and the enrolment of a diverse range of actors and organisations. In order to succeed in this challenge, the Champion draws on his/her own human capital resources including a problem-solving nature and high levels of persistence, as well as mobilising organisational resources including colleague support, information and assistance.

The Championing of district heating is thus conceptualised as a function of both the innate qualities of the individual (his/her human capital characteristics) which drives individual initiative, as well as the
organisational context and the ‘opportunity for Championing.’ The existing literature highlights a relationship between structure, organisational resources and the ‘opportunity for Championing’ (displayed in Figure 5.1). This study has reinforced this link, but also revealed the importance of an appreciation of the nature of the organisation as a public sector body, which has been shown to influence the ‘opportunity for Championing,’ as well as shape the behaviour of the Champion in his/her efforts to gain access to, and exploit critical organisational social capital resources. The Local Authority, in comparison to a private sector organisation is subject to unique conditions including policy pressures, relating to the environment and housing and the overriding need to ensure value for public money and accountability of actions. The hierarchical, bureaucratic culture of the organisation pose a challenge for the Champion of district heating who must frame DH as ‘in the public interest’ in order to access critical organisational resources. The public sector Champion of district heating is actually aware of his/her public sector obligations, which act to constrain and shape his/her Championing behavior. The results consequently demonstrate the importance of appreciating the nature of the organisation; public sector and private sector bodies may create very different Championing conditions.

Successful Championing of district heating is contingent on the ability of the Champion to create the necessary forms of social capital for which the Champion must exploit his/her own human capital resources, as well as organisational citizenship behaviours (OCB). This enables access to the critical resources of information & knowledge, assistance and affective support. Relational social capital is highlighted as pivotal to Championing attempts; the establishment of affective relationships enable the Champion to benefit from connections based on trust, likeability and perceived obligation. The ability of the Champion to forge affective connections can
be considered as the glue that holds his/her network of ties together and engenders the willingness of key actors to impart their time, effort and support to the Champion’s cause.
**Social Capital Features**

- **Structural social capital**: The champion forges new connections between disparate organizational departments bringing divergent actors together in pursuit of the shared goal i.e. district heating.
- **Structural holes**: Enable access to critical expert knowledge
- **Member support critical**: Support for DH when framed as 'in the public interest.'
- **Relational social capital**: The champion develops affective relationships based on trust, likeability, and perceived obligation, vital for accessing and exploiting social capital resources of support, assistance, and information & knowledge.
  - The public sector duty to 'serve the public' & resultant public sector obligation is a valuable resource for:
  - Mobilising support for DH when framed as 'in the public interest.'

- **Cognitive social capital**: By embedding the DH initiative into existing org agendas, a shared language is utilised, legitimising DH.

- **Fuel Poverty**, "Sustainability"

**Human Capital Features**

- **Personality characteristics**: High levels of Agreeableness, strong altruistic tendencies, Openness, Conscientiousness, persistence, enthusiasm, dedication, problem-solving.
- **Entrepreneurial tendencies**: Willingness to accept reputational risk, dislike of routine work & business creation.
- **Motivations**: Positive change; social & environmental drivers.
- **Values**: Altruistic: charitable behaviour, social concern, sustainability; 'generosity of spirit.'
- **Education**: Formal education, variety of subject matter, technical (DH) knowledge base not essential; generalists rather than specialists.
- **Skills**: Communication, leadership, negotiation.
- **Career experience**: Varied, but not extensively so, lower-level champions tend to have greater LA tenure prior to championing, developing strong organisational reputations.

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**Public sector organizational environment**

**The Opportunity for Championing**: Policy pressures (environment sustainability, social housing, energy efficiency); local (organisational) problems (Fuel Poverty, ageing dwellings & heating systems); lobbying pressures (environmental groups & local businesses); initiative of champion, enabling finance (grant funding, internal funds).

**Public service nature of role**: This shapes the champion’s behaviour; the champion seeks to demonstrate the community benefits of initiative, transparency, & accountability in actions.

**Culture & structure**: Hierarchical, bureaucracy can increase complexity, engenders rational pursuit of change gaining Senior Management support first prior to colleague support, through existing organisational systems of authority, bound by public sector duty to ensure accountability & transparency. Elected Members and Councillors are critical & powerful actors.

**Nature of Innovation**: DH as a large, complex infrastructure requires securing of significant investment, understanding of complex business & contractual models, enrolling of divergent actors & organisations; DH system building requires a willingness to ‘bend the rules’ if needed to by-pass bureaucracy, utilisation of a range of tactics, tailored to the specific actor/group (incentives: lower fuel bills, trips to successful schemes, creating awareness & understanding) needed to overcome entrenched practices and habits caused by incumbent system, display long-term vision; counter-reverse salients which threaten system expansion.

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**Figure 8.1: The championing of district heating**
CHAPTER 9 DISCUSSION & CONCLUSION

9.1 Introduction

The concluding chapter highlights the key findings in pursuit of the research objectives and articulates the contribution to knowledge that this thesis makes. The analytical framework developed in Chapter 5 will allow an examination of the central findings of the thesis. The championing of district heating is thus conceptualized as a function of both the innate qualities of the individual (his/her human capital characteristics), as well as the organizational context and the ‘opportunity for championing.’ Successful championing of district heating is contingent on the ability of the champion to create the necessary forms of social capital for which the champion must exploit his/her own human capital resources, as well as organizational citizenship behaviors (OCB). This enables access to the critical resources of information and knowledge, assistance and affective support. Relational social capital is highlighted as pivotal to championing attempts; the establishment of affective relationships enable the champion to benefit from connections based on trust, likeability and perceived obligation. The ability of the champion to forge affective connections can be considered as the glue that holds his/her network of ties together and engenders the willingness of key actors to lend their time, effort and support to the champion’s cause. The implications and relevance of the findings for future DH system builders is examined, consideration will also be given to the limitations of the research. Potential avenues of future research are explored.
9.2 Contribution to Knowledge

As the central component of the analytical framework the contribution to knowledge that this thesis makes has been to reveal the critical role of the DH champion as a public sector agent of change, elucidating the unique human and social capital features that provide an understanding of why, and how, certain individuals may be inclined to champion (the ‘origins’). The origins of champions of change are complex; the very questions of ‘how’ and ‘why’ an individual comes to champion can be splintered along action and structural based lines of enquiry. The ability to fully answer this question requires a broad consideration of ‘how’ and ‘why’ that is not limited to the individual or the organisation in isolation. The study has demonstrated that a comprehensive understanding of the origins of champions of change cannot come through isolation of the champion from the championing context, or the innovation from the championing attempt.

A number of critical human capital features, a key component of the analytical framework, have been shown to influence the propensity of the individuals in this study to engage in championing. The champions possess compassionate, helpful and inquiring natures, are persistent and strong-willed. High levels of Openness demonstrate, a strong capacity for change, an ‘inquiring intellect’ and an ability to interpret and adapt to the perspectives of others. A willingness to incur personal risk in the workplace and a general dislike of routine work has highlighted entrepreneurial tendencies that act to draw the champions to innovative projects, outside of the remit of their official workplace duties. However, champions of district heating are not moved to innovate for the sake of innovation itself or through an ‘intrinsic need for excitement,’ their
personal motivations stem from social and environmental concern, and a strong awareness of their public sector duties. This is in contrast to recent literature which suggest champions are moved to innovate through an intrinsic need for excitement (Mansfield et al. 2010).

The champions’ career experience in other public, private and third sector roles has enabled them to amass skills and knowledge useful to their championing endeavour. These include a knowledge of sustainability issues as well as communication and project management skills. The participants’ obtainment of a good standard of education, coupled with their high scores in Openness, are indicative of a relatively high cognitive ability that is valuable given the complexities associated with championing an LTS.

The ability of the champion to instigate the change needed to implement a district heating system, the ‘how’ element of champion origins, is the result of a combination of human and (organisational) social capital resources. This interaction is shaped by the public sector context in which the championing attempt takes place. Social capital is pivotal to championing efforts. The champion must exploit his/her own human capital resources, as well as a range of organisational citizenship behaviours (OCB) to create structural, relational and cognitive forms of social capital. Through meetings, presentations and face- to-face lobbying the champion creates a network of ties that provide access to the necessary resources of assistance, knowledge and information. As the champion is a generalist rather than a specialist, and knowledge of DH is limited within the LA organisational context, structural holes enable the champion to access expert DH knowledge. The champion creates cognitive social capital by tying DH to an existing organisational
agenda which has its own familiar language, such as ‘fuel poverty,’ and ‘sustainability.’ DH thus becomes embedded in social and environmental agendas which acts to legitimise the technology and help to create a shared understanding. Of particular relevance to the public sector champion are the AOCB of functional participation, loyalty and obedience; the conventional, hierarchical nature of LA organisations necessitate a non-controversial championing approach. The champion therefore, promotes the innovation as being of benefit to the local community and existing organisational agendas in a rational pursuit of support. Challenge-oriented organisational citizenship behaviours (COCB) (advocacy participation and ‘voice’) are important in generating organisational attention and demonstrating the willingness of the champion to alter the status quo.

However, they must swiftly be followed by affiliation-oriented organisational citizenship behaviours (AOCB’s) in order to legitimise the championing attempt. In the traditional, risk-averse context of the public sector Local Authority, the champion must be viewed as acting in the organisation’s best interest rather than a ‘renegade’ municipal worker. The duty to ‘serve the public’ has been shown to be a both a strong motivator for championing action and a resource to be drawn on when attempting to engender and mobilise organisational support. Through AOCB, framing the initiative as being ‘in the public interest’ and promoting its social and environmental benefits, the champions appeal to the public sector obligations of their fellow organisational members. This appeal to the values of colleagues and superiors is a vital part of creating relational social capital, the affective nature of the relationships within the champion’s network of ties. Of the three forms of social capital examined, relational social capital is the most critical as
the champion’s efforts are dependent on his/her capacity to enrol a host of actors all with divergent agendas, objectives and affiliations. An affective connection is therefore vital as it strengthens connections with actors and allows the champion to harness the benefits of a relationship based on trust, perceived obligation and likability. The champions’ human capital features, including personal qualities and ‘position of power,’ are significant resources in this endeavour engendering feelings of respect, credibility and trust. The champions’ ‘position of power’ within the organisation is derived from his/her official organisational status, for higher-level champions; in the case of lower-level champions their ability to influence is a function of their tenure within the organisation. The Officer-level champions have generally developed strong workplace reputations, established during their lengthy employment within the LA prior to instigating change. Their tenure has also enabled the development of a network of ties that can be mobilised during their champion attempt. The Planning and Housing departments represent particularly important sources of social capital. The Planning department provides access to the critical resources of knowledge and information on existing and new build developments in the area and heat mapping capabilities. The Housing department, through its Fuel Poverty agenda, is an important source of legitimising information. This supports the assertion made by Hauschildt and Kirchmann (2001) that more complex innovations require more than one ‘promoter.’ Gaining the support of the political faction of the Local Authority in particular was stressed as crucial; this group emerged as highly significant in progressing the DH agenda. These actors represent important sources of legitimization and organizational power, supporting the findings of Bolton (201) who noted in his study the importance of a political champion. Damanpour and Schneider (2009) also emphasise the public
sector reliance on political control.

The public sector organisational context has generated a number of peculiarities to DH championing, namely the bureaucratic nature of local Government, the public-service orientation and the criticality of Member/Councillor support. The champions displayed a strong awareness of their underlying duty to ‘serve the public’ and also to ensure transparency and value for public money; this acted to shape their championing behaviour. The public sector duty also represented an important resource for mobilising support. By framing the DH initiative as the solution to a prevalent, often emotive organisational agenda, such as Fuel Poverty, the champions played on the ‘public sector duty’ of organisational members. This counters Winskel’s (1998) criticism that system builders are attributed with too much authority; the system builders in this study are not all-powerful actors, they are very much constrained by their context and public sector duties.

In the introduction it was argued that accounts of championing tend to ‘black box’ the innovation and disconnect the championing initiative from its context. In addition, recent approaches to the study of DH in a UK context have tended to adopt a macro-level approach (Hawkey, 2009; Bolton, 2010), that has failed to capture the micro-level intricacies of system building.

As discussed in Section 2.8, Bolton (2010) highlights the importance of a champion for the development of DH in the UK, defining the roles of a Technical and Political Championing, in doing so Bolton delineates some of the key roles of both a grass-roots and a higher-level Champion. Although Bolton appreciates the role of these ‘entrepreneurial
individuals,’ drawing a comparison with Hughes’ notion of dedicated system builders, his analysis fails to delve further to consider the qualities required of a DH champion, his/her skills base or the behaviours necessary to fulfil the duties he describes.

Likewise, Hawkey (2009) attributes the development of DH in some areas in the UK to the enthusiasm of certain LA employees (Section 2.8). Hawkey goes on to suggest the importance of a national champion for DH, but fails to expand on these notions.

This thesis therefore, makes an empirical contribution to knowledge through the revelation of the origins (the how and why) of Champions of DH systems in the UK; by focusing on the champion as a chief system builder, insights have been generated into the practical realities of DH introduction from a public sector perspective. An emphasis on DH as an LTS has highlighted the relevance of appreciating the reciprocal nature of technological development, as well as the importance of acknowledging the characteristics of the technology which impact upon system building. The champions employ a range of system building strategies that aim to inform, convince and reassure the host of actors within, and affected by, the LTS. Although the champions have all shown a willingness to ‘bend the rules’ if necessary in order to by-pass the bureaucracy of their public sector environment, the strategies employed were rational. The champions work within the existing systems of authority and rules and on the whole seek the support of Senior Management prior to gaining lower-level organizational support. As a large scale infrastructure, DH requires significant capital investment which necessitates complex business models and contractual requirements. The development of a conceptual model uncovers the interaction between the
critical human and (organizational) social capital features of DH champions, and the contextual factors which shapes this interactions.

9.3 Revisiting the Research Questions The central research question and sub-questions defined in the introductory chapter will now be addressed in turn:

*How and Why do certain individuals emerge to champion district heating within a Local Authority Context?*

The mixed methods approach detailed in chapter 5 allowed a comprehensive understanding of both action (chapter 8) and structural (chapter 7) aspects of the championing attempt. The ability of the champion to create structural, relational and cognitive forms of (organisational) social capital has been shown to be strongly dependent on the utilisation of his/her human capital resources, thereby highlighting the interaction between structure and action.

The long standing debate in the literature on the primacy of the individual over his/her context generates a number of debates. A much contested issue is the extent to which a champion is born, i.e. predisposed to champion by innate qualities, or is simply executing a role that anyone could be trained to perform, the ‘made’ argument. The findings have contributed to the debate by indicating that whilst certain aspects of championing maybe learned, such as the skills developed through career experience, there are certain attributes such as motivation and disposition that explain an individual’s propensity to champion as well as critically their success in such endeavours. These champion attributes have been
shown to be important influencing factors in the creation of the (organisational) social capital resources needed to implement change.

This study provides a departure from traditional approaches to assessing personality features in the championing literature; the use of a validated personality tool has enabled a more objective assessment of personality, moving away from the existing predominance of studies based on the subjective opinions of the researcher. The BFI, a well-established personality inventory, has enabled a broader appreciation of ‘personality’ than current conceptualisations. The findings shows that DH champions score highly in Agreeableness which is strongly associated with altruism, compassion, cooperation and a tendency to help others (Costa and McCrae, 1992).

The personality assessment found Openness to be closely followed by Agreeableness as a dominant trait. This finding supports the notion that champions are unconventional; a champion will willingly swim against the tide, actively working to alter the status quo with alternative and original solutions. Champions in this sense stand out from their colleagues; in the words of Champions 6 and 13 they are ‘mavericks.’ The high scores in openness coupled with the relatively high standards of education achieved indicate that the champions have a high cognitive ability; this is necessary given the significant demands of championing a complex, large-scale infrastructure project.

The participants also scored highly in Conscientiousness, the trait associated with achievement, persistence and a strong will (Costa and McCrae, 1992). This resonates with the qualitative findings which demonstrate that the champions, as a whole, are high achievers; indeed,
the achievements of some have been nationally recognised. Although the participants all expressed a willingness to incur personal risk in the workplace as well as an acceptance of ‘bending the rules,’ they adopted rational strategies that display obedience and loyalty appearing as a ‘good organisational citizen.’ Organisational Citizenship Behaviours (OCB) have been found to serve different purposes during the championing attempt. COCBs including advocacy participation, have been shown to be relevant for creating attention and awareness of the idea of DH which is counter to the status quo, whilst AOCB’s are integral to legitimising the championing endeavour.

Interestingly, and contrary to the tendency in the literature to emphasise extravert-like qualities, the champions possessed low levels of extraversion. In spite of Mansfield et al.’s (2010) assertion that champions are motivated by an intrinsic need for excitement, the study has demonstrated that the motivation for championing district heating is more complex. On an individual level the ‘propensity to champion’ can be considered as the result of personal motivations and values, as well as dispositional features.

The champions’ ability to create the necessary forms of (organisational) social capital was critical to the championing attempt. The champion must enrol a range of actors both internal and external to the LA with the relevant skills and capabilities. The creation of structural social capital through meetings, presentations and face-to-face lobbying has been pivotal. Due to the nature and remit of the LA, expertise on DH is limited; internal networks of ties are insufficient in accessing the required knowledge and information. The existence of structural holes in the champion’s network enable the champion to establish new connections
with the relevant experts (‘bridging capital’ as discussed by Hawkey, 2010). Due to the fact that the knowledge is in limited supply within the LA, its ‘use value’ as described by Foley and Edwards, (1990) is high. This reinforces Beatty and Gordon’s (1991) assertion that weak network ties may be as important, if not more so, than strong ties. Gaining the support of the political Members/ councillors in particular was stressed as crucial; this stakeholder group emerged as highly significant in progressing the DH agenda, representing important sources of legitimisation and political power.

The ability of the champion to infuse these connections with an affective quality is central to gaining access to the required resources of knowledge, assistance and support, which only strong, quality connections can bring. This is contingent on the champion exploiting his own human capital resources namely his/her likeable persona, workplace reputation and organisational citizenship behaviours (OCB) to engender the trust and respect of organisational members. The champions also tap into and exploit the perceived obligations of colleagues and superiors through framing the DH initiative as being ‘in the public interest.’ Through tying DH to existing organisational agendas that have their own shared language such as ‘fuel poverty’ or ‘sustainability,’ the champion legitimises DH through the creation of cognitive social capital, thereby increasing shared understanding.

The workplace reputations of the champions have also been found to influence the willingness of others to engage with, and support, the champion. The participants were generally well-established organisational members with up to 26 years of experience within their Local Authority. This lengthy tenure enables the development of
structural social capital in the form of networks of ties that can be mobilised during the championing attempt. It also enhances the ability of the champion to create relational social capital through the development of strong, credible workplace reputations.

*How does the ‘opportunity for championing’ arise?*

The ‘opportunity for championing’ district heating is multi-dimensional. It is the result of the complex interaction between the attributes of the individual and contextual factors. Critical contextual factors include public sector obligation and responsibility, driven by national and local policy drivers, the vested interests of actors external to the LA and the autonomy of the champions. Wider Sustainability and Fuel Poverty agendas stimulated the need for an organisational response to policy responsibilities. In the absence of a specific DH policy, the scope for DH as an ‘alternative solution’ lies in the creative interpretation of these public sector obligations, which is dependent on the initiative, originality and drive of innovative individuals. This is a function of the dispositional and motivational attributes of the champion in response to organisational context. The ‘opportunity for championing,’ therefore, puts the champion, as well as the innovation, in context and reflects the importance of a broader consideration of ‘motivation.’ The availability of funding, predominantly in the form of grant support, has been shown to be an important enabling factor for championing action. No significant differences were found between those champions who were formally appointed and those who emerged informally in terms of the ability to create the necessary forms of (organisational) social capital. Moreover, both informal and formal champions faced similar challenges in terms of
the need to convince, demonstrate viability and maintain support.

How does the nature of DH as a large technical system (LTS) affect the champion attempt?

An Examination of the sociotechnical nature of DH has revealed a number of unique features that affect the ability of the system builder to instigate change, these have been examined in Chapter 6. The parallel between Hughes’ notion of the ‘system builder’ and the champion has been firmly established. The system builder and the champion are both problem-solvers; they rely on the skills and support of a range of actors, with both being generalists rather than specialists. DH champions are thus system builders; whilst they share similarities with general champions of change, as an LTS DH imposes its own challenges and shapes the actions of the DH system builder. The champion of DH must not only win over organizational actors, he/she must enroll a host of individuals and organizations who are affected by the wide ‘reach’ of DH. These include prospective subscribers who are generally unaware of DH as an energy choice and are presently ‘tied’ to an existing energy system. The champions must effectively dislodge the incumbent system, as described by Summerton (1992). As such, the disruption and level of upheaval associated with DH and the ‘scope’ of the system in terms of the range and variety of actors and organizations that are affected by its introduction, place unique demands on the champion of DH. At once the champion must gain cross-departmental organizational support, as well as winning over prospective public sector, commercial and domestic subscribers (depending on the configuration of the network).

A lack of knowledge and awareness surrounding DH which has had a patchy history in the UK means there is limited experience of the
technology. This coupled with the large upfront capital investments and consumer contractual issues associated with complex business models create technology-specific challenges. Given that DH is a large-scale, long-term proposition, the ability to display forward-thinking in the sense of articulating a long-term vision for the network is imperative. As well as considering initial or start-up network, the champions must also establish the long-term plan for how that network will grow, acknowledging future demand and prospective developments which may connect to the network. The champions must work with a range of actors and organizations to outline a potential district heating network; this requires significant communication and negotiation skills to convince a range of stakeholder groups, often with competing needs, that supporting and connecting to the network is in their own best interests. In order to enroll relevant stakeholders, the DH system builder must employ a host of tactics and strategies that aim to create long-term system appeal. DH is a long-term energy option, commitment to the network in terms of energy contracts needs to be in the range of 20 years in order to provide the network operator with the security they need to provide energy.

The champion has been shown to have a significant influence on the technological ‘style’ of each system. Bolton (2010, p.40) discussing Hughes (1983), noted how the ‘entrepreneurial drive and decisions’ of each system builder plays a part in influencing the varying ‘styles’ of technological systems. This study has shown how the central system builder plays a key role in forming the system goal such as alleviating fuel poverty or improving energy security, as well as shaping the configuration of the network through the enrollment of prospective subscribers. For example, the technological ‘style’ of Aberdeen DH system can be described as one of social benefit; adherence to housing standards and a commitment to reducing Fuel Poverty,
as well as the initiative and passion of the Champion shaped this style. Contrast this with the style of Southampton which was shaped by shocks in the oil market, leading to the search for alternative energy sources and through a commitment to creating a more sustainable long-term energy system for the city, its champion helped to shape a DH characterised by innovation, sustainability and energy security. Furthermore, the study has provided empirical evidence of the continued relevance of the system builder concept for the study of DH as and LTS. However, the role of wider structural influences has also been appreciated, such as the growing institutional support for DH and wider policy agendas.

9.4 Limitations & Future Research

In order to increase the generalisability of findings, it could be beneficial to extend the study to incorporate a greater number of participants; although it must be appreciated that the ‘champion’ is a relatively rare phenomena (Howell and Higgins, 1990; Shane, 1994) and UK DH champions even more so. Despite the best efforts of the Researcher, the study has only included two female champions. As far as possible, efforts have been made to appreciate any differences between the male and female participants, although it is clear that more research is needed in this area. The competing demands placed on Local Authority workers has meant that not all aspects of the study were completed by each participant. The self-completion survey, for example, was completed by 15 of the 17 participants. At a time of increasing pressure on public services, more investigation is warranted on the capacity of LA workers to act in championing roles.
The internal reliability indicators for the Agreeableness factor as part of the personality assessment appeared unusually low. However, given that the BFI is an established personality measure, which has well-tested internal consistencies, attempts were not made to alter the scale by removing the negatively correlated items. In order to increase the reliability of results a re-test of the Agreeableness scale could be beneficial, although the high Agreeableness score is supported by the qualitative findings, which indicate strong altruistic motivations, values and behaviours within the group. In order to establish a stronger link between altruistic tendencies/motivations and championing behaviour, the test could be extended to champions of other innovations in different contexts.

There were a number of avenues of exploration that emerged as worthy of further attention. It would be interesting to establish whether the conceptual model developed in this study holds relevance for champions in other public sector contexts. Is the notion of a ‘good organisational citizen’ more relevant for public sector champions? These ideas inspire further research into public sector champions. The literature has indicated that champions are shaped by cultural conditions (Shane et al. 1995), as such it could be interesting to examine the extent to which the DH champion conceptualised in this study holds relevance in other countries attempting to advance the DH agenda.

The study has attempted to provide insights into the ‘born vs made’ debate in the literature. However, more research is needed to examine the potential differences between those who have been formally appointed to champion and those have emerged more informally. The five formally appointed participants in this study, like they informal counterparts,
shared similar motivations rooted in altruistic concern; similarly, their personality profiles also contained high Agreeableness, Openness and Conscientiousness scores. As such, efforts should be directed towards establishing greater consensus on the significance of these ‘champion attributes,’ and their relevancy to both informal and formal champions in order to increase the generalisability of findings.

A number of wider avenues for future research emerged during the course of the study including the nature of public acceptance of ‘alternative’ energy systems. Thus far scant attention has been given to the most important social and economic base of a DH system (Summerton, 1992), the customer group. The importance of cost, namely lower energy prices, was emphasised as pivotal to gaining subscriber acceptance in some of the cases studied. The ability to deliver lower prices will be dependent on the market alternatives and the cost of existing options. Research into the demand-side aspects of DH, particularly the engagement of potential subscribers, is needed.

The energy landscape is changing; in the drive to increase energy security and move towards more sustainable systems of energy supply DH systems have been given an important role as a vital enabling infrastructure. The pivotal role of the champions in this study in initiating, promoting and mobilising organisational support indicates the significance of Local Authority champions of change. The extent to which a champion can be harnessed through training and development may become an increasingly important issue in light of the growing DH agenda. The utilisation of skills gained during previous work positions indicates that certain skills relevant to championing may be learned. The system building strategies employed in this study may provide initial
guidance as to the skills and tactics central to the role. However, attempts to ‘harness’ a DH champion may prove futile in the absence of a compassionate nature, a strong-will and a capacity for change, features which are not so easily engineered.
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APPENDICES

APPENDIX A: PRIMARY RESEARCH DETAILS: THE CHAMPIONS

<table>
<thead>
<tr>
<th>Reference Code</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Champion 1</td>
<td>Lerwick</td>
</tr>
<tr>
<td>Champion 2</td>
<td>Coventry</td>
</tr>
<tr>
<td>Champion 3</td>
<td>Fife</td>
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<tr>
<td>Champion 4</td>
<td>Isle of White</td>
</tr>
<tr>
<td>Champion 5</td>
<td>Renfrewshire</td>
</tr>
<tr>
<td>Champion 6</td>
<td>Dundee (Housing Department)</td>
</tr>
<tr>
<td>Champion 7</td>
<td>Camden</td>
</tr>
<tr>
<td>Champion 8</td>
<td>Leeds</td>
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<tr>
<td>Champion 9</td>
<td>Aberdeen</td>
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<tr>
<td>Champion 10</td>
<td>Swindon</td>
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<tr>
<td>Champion 11</td>
<td>Birmingham</td>
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<tr>
<td>Champion 12</td>
<td>Barnsley</td>
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<tr>
<td>Champion 13</td>
<td>Woking</td>
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<td>Champion 14</td>
<td>Sheffield</td>
</tr>
<tr>
<td>Champion 15</td>
<td>West Suffolk</td>
</tr>
<tr>
<td>Champion 16</td>
<td>Dundee (Engineering Department)</td>
</tr>
<tr>
<td>Champion 17</td>
<td>Southampton</td>
</tr>
</tbody>
</table>
APPENDIX B: SECONDARY RESEARCH PARTICIPANTS

Participant 1  Former DH Engineer, Wildmill, Bridgend
Participant 2  Former DH Tenant, Wildmill, Bridgend
Participant 3  Manager, Newport City Homes
Participant 4  Former BRE Consultant
Participant 5  BRE Consultant
Participant 6  BRE Consultant
Participant 7  Swedish DH Consultant
Participant 8  Swedish DH Consultant
Participant 9  UK DH Business Model Expert
Participant 10 Team member, Southampton DH Scheme.
<table>
<thead>
<tr>
<th>Participant 11</th>
<th>Commercial Director, Waste/Energy Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 12</td>
<td>Commercial contractor/installer, DE Company</td>
</tr>
<tr>
<td>Participant 13</td>
<td>Welsh Government representative</td>
</tr>
<tr>
<td>Participant 14</td>
<td>Manager, LA-Led DH ESCo</td>
</tr>
<tr>
<td>Participant 15</td>
<td>UK DH Expert</td>
</tr>
<tr>
<td>Participant 16</td>
<td>Team member, Coventry DH scheme</td>
</tr>
<tr>
<td>Participant 17</td>
<td>LA Officer, Woking Borough Council</td>
</tr>
</tbody>
</table>
APPENDIX C: RESEARCH INSTRUMENTS

The research instruments are detailed below; the self-completion survey (which consists of two parts) and the interview schedule.

**Self Completion Survey**

The self-completion survey consists of two parts, which were administered through an online survey tool, the first questions consider the role and context of the champion, their efforts and behaviours and their value systems. The 2nd part comprises the 44-item BFI Personality Inventory.

*R=Rating Questions 1: strongly disagree-5: strongly agree.*

i. Which Local Authority do you (or did you) work for?

ii. Which description most accurately describes a District Heating Champion?

iii. Please explain your role in championing District Heating.

iv. Taking time to consider, please detail any personal attributes or qualities that you feel are necessary for the role of District Heating champion.

v. Taking time to consider, please detail any skills you feel are vital for championing District Heating initiatives.

vi. We as citizens have a moral duty to protect those in society who are less fortunate than ourselves."

vii. R. 'Community' is more important than 'individual'

viii. What attracted you to a job in the public sector?

ix. How conscious were you in your role as District Heating champion of your duty as a public servant?

x. Do you currently or have you ever supported a charity or community initiative?

xi. R. "I worked 'above and beyond' the call of duty to make District Heating a
success."

xii. R. "Building support sometimes required manipulation."

xiii. R. "I am willing to put my personal reputation at risk if I believe strongly in a project."

xiv. R. "I'm comfortable with bending the rules if it means by-passing the bureaucracy."

xv. R. "Experience, knowledge and skills are most relevant to championing not personality."

xvi. R. "District Heating is a team effort."

xvii. R. "There isn't a strong sense of unity within the Council, each department drives their own agenda, often with little cross-departmental cooperation."

xviii. R. "I couldn't have succeeded in championing District Heating without the support of my colleagues."

xix. Please detail those persons internal to the Council or otherwise who were instrumental in supporting you in championing District Heating.

xx. Have you received recognition for your role in advancing the District Heating agenda? Please provide any details.

xxi. In your opinion do you feel the Local Authority working environment is more or less likely to lead to the emergence of a Project Champion?

xxii. Do you feel that individuals could be trained to take a championing position?

xxiii. Which did you attempt to gain first, cross-departmental support or senior management support?

xxiv. Please detail any ways in which you built support for the initiative.

xxv. What were the biggest challenges to progressing the District Heating agenda?

xxvi. Considering carefully, what was key to your championing success?

xxvii. What would you do differently if you could?
The Big Five Inventory (BFI) John and Srivastava (1999)

I see myself as someone who ....

(1: strongly disagree-5: strongly agree)

1. is talkative
2. tends to find fault with others
3. does a thorough job
4. is depressed, blue
5. is original, comes up with new ideas
6. is reserved
7. is helpful and unselfish with others
8. can be somewhat careless
9. is relaxed, handles stress well
10. is curious about many different things
11. is full of energy
12. starts quarrels with others
13. is a reliable worker
14. can be tense
15. is ingenious, a deep thinker
16. generates a lot of enthusiasm
17. has a forgiving nature
18. tends to be disorganized
19. worries a lot
20. has an active imagination
21. tends to be quiet
22. is generally trusting
23. tends to be lazy
24. is emotionally stable, not easily upset
25. is inventive
26. has an assertive personality
27. can be cold and aloof
28. perseveres until the task is finished
29. can be moody
30. values artistic, aesthetic experiences
31. is sometimes shy, inhibited
32. is considerate and kind to almost everyone
33. does things efficiently
34. remains calm in tense situations
35. prefers work that is routine
36. is outgoing, sociable
37. is sometimes rude to others
38. makes plans and follows through with them
39. get nervous easily
40. likes to reflect, play with ideas
41. has few artistic interests
42. likes to cooperate with others
43. is easily distracted
44. is sophisticated in art, music, literature
Interview Schedule

a. What date did you join the Local Authority?

b. What was your job title and seniority at the time of championing DH?

c. How long did you spend in that position prior to the championing attempt?

d. What was the motivation (or stimulus) for DH?

e. How did you come to be involved in DH?

f. Were you instrumental from the start (idea conception)?

g. Had you any previous experience (personally or professionally) of DH systems?

h. Were you well supported internally (and from the start)?

i. Were there any obstacles or challenges to progressing the DH agenda?

j. Have you prior to championing DH or since, been involved in championing any other initiatives?

k. How do you feel about the term, ‘Champion?’

l. How do you feel about the project achievements?

m. Are you involved in any charitable/voluntary initiatives?

n. Can you describe your educational path?

o. Prior to your LA position can you describe your career history?

p. What are your career/personal goals?

q. Have you ever established your own business?
<table>
<thead>
<tr>
<th>Personality Characteristics</th>
<th>Experience, Expertise &amp; Knowledge</th>
<th>Behaviour</th>
<th>Organisational</th>
<th>Motivation</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk takers (Schön, 1963; Cox (1976); Beatty and Gordon, 1991; Howell and Higgins, 1990; Markham and Aiman-Smith (2001); Lefley (2006).)</td>
<td>18+year’s employment (Howell and Higgins, 1990) Tenure influences the willingness to engage in innovation, up until a certain point when resistance to change can set in (Damanpour and Schneider, 2009).</td>
<td>Rational strategies-operating within the org. framework (Beatty and Gordon, 1991); Howell and Higgins, 1990; Gattiker and Carter (2010). Individual initiative (Andersson and Bateman, 2010).</td>
<td>The champion acts inside the organisation (Day, 1994). The champion may be actively sought by Management (Pinto and Patanakul, 2015). The champion does not possess control of the necessary resources (Stevenson and Jarillo, 1990). High organisational commitment (Mansfield et al. 2010). Organic structures may enhance the expression of individual behaviour and increase the likelihood of champion emergence (House, 1991; Higgins, 1990).</td>
<td>Motivation for environmental career pathway, environmental issues seen as a ‘hot topic,’ the alignment of private environmental interests with professional life task, (even if this involved a career penalty- meant a lower salary) (Marksusson, 2010). Intrinsic values (Chrusciel, 2008). Intrinsic need for</td>
<td>Factors that enabled leadership by water champions-rapid and substantial change, crises- political and community concern Taylor et al. (2012, p.86). Cultural differences in championing (Shane et al. 1995). Regulatory pressures (Markusson, 2010).</td>
</tr>
<tr>
<td>Innovation Variables</td>
<td>Description</td>
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<tr>
<td>Socially-independent (Cox, 1976);</td>
<td>Need for independence (Mansfield et al. 2010).</td>
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<tr>
<td>Personal values (Taylor et al. 2011)</td>
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<tr>
<td>Charisma (Jenssen and Jørgensen, 2004, Howell and Higgins, 1990)</td>
<td>Tenure is linked with respect and legitimacy within an organisation (Damanpour and Schneider, 2009).</td>
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<tr>
<td>Importance of career experience (Markusson 2010; Kamal)</td>
<td>Working in various dept’ s. (Howell and Higgins, 1990)</td>
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<tr>
<td>Timeliness (Taylor et al. 2011)</td>
<td>Selling of a solid business idea to top management then selling the idea to users (Beath, 1991, Howell and Higgins, 1990).</td>
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<tr>
<td>Timeliness (Taylor et al. 2011)</td>
<td>Availability and attitude of innovation support (Howell and Higgins, 1990).</td>
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<tr>
<td>Timeliness (Taylor et al. 2011)</td>
<td>An organisational culture in which there is a negative attitude towards innovation requires a strong financial approach, in less conservative organisations which have a relatively positive outlook on innovation, a more strategic argument for the adoption of the innovation may be sufficient (Howell and Higgins, 1990).</td>
<td></td>
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<tr>
<td>Availability and attitude of innovation support (Howell and Higgins, 1990)</td>
<td>Executive champions utilise ‘Position power’ (Taylor et al. 2011 p.428), creating a safe environment for project champions.</td>
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<tr>
<td>Availability and attitude of innovation support (Howell and Higgins, 1990)</td>
<td>Motivated by the positive impact the innovation could have on the company (Moon de Leon 2001) leader’s values affect innovation adoption.</td>
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<tr>
<td>Executive champions utilise ‘Position power’ (Taylor et al. 2011 p.428), creating a safe environment for project champions.</td>
<td>Importance of impact of innovation characteristics on innovation adoption (Damanpour and Schneider, 2009).</td>
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<tr>
<td>Confidence in their own capability and mission (Jenssen and Jørgensen, 2004); Scheufele and Shad (2000).</td>
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<tr>
<td>Enthusiasm (Howell et al. 2004)</td>
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<td>Capacity to inspire others and gain binding support for the innovation from colleagues (Burgelman, 1983; Maidique, 2010); Gupta et al. (2006).</td>
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<td>A high-ranking job, good education and experience and competence (Holbeck, 1990).</td>
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<tr>
<td>The tendency in public sector organisations for life long employment can stifle creativity through lack of varied experience (Holbeck, 1990).</td>
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<tr>
<td>Builds a coalition of supporters at the lower levels of the organisation through ‘selling’ the change (Beatty and Gordon, 1991, Howell and Higgins, 1990).</td>
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<tr>
<td>Using a participating process (Howell and Higgins, 1990).</td>
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<tr>
<td>Informal strategies</td>
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<tr>
<td>Assistance from those in power and authority act to support and legitimise the innovation (Holbeck, 1990); Mullins et al. (2008).</td>
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<tr>
<td>An organisational climate supportive of innovation (Mullins et al. 2008).</td>
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<tr>
<td>Management support may stimulate the gaining of necessary resources and additional political support (Jenssen and Jørgensen, 2004)</td>
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<tr>
<td>The champion could elicit the support of management as they themselves could be viewed as a source of competitive advantage (Alvarez and Busenitz, 2001).</td>
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<tr>
<td>Management support legitimises the champion’s strategy (Beath, 1991) and possibly reduces the need on the part of</td>
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</table>

(Howell and Higgins, 1990).

The ability to offer creative solutions to organisational problems (Beath, 1991, Howell and Higgins, 1990).


Skills and knowledge important for innovative work (Magnusson, 2010)

Educated managers may be better able (cognitively) to deal with the information processing requirements of complex innovations (Jenssen and Jørgensen, 2004) use Augsdorfer’s (1994, p.91) term, ‘bootlegging,‘

Informal communication channels (Beatty and Gordon, 1991).

Connection between method of influence and power of target (Howell and Higgins, 1990).

the champion of using excessive force or non formal resource acquisition strategies.

Innovations can fail due to power struggles within the organisation; those who seek to protect their own interests may act to block the innovation (Jenssen and Jørgensen, 2004). Howell and Higgins (1990) argue that Management could play a protective role in these instances.

The relationships enjoyed by the champion with colleagues (and external contacts) are deemed important by Beatty and Gordon (1991); Howell and Shea (2001) with weak ties potentially proving more important that strong ones as they enable access to parts of the social system that would otherwise be cut off.
<p>| Patience &amp; aggressiveness over a long period (Beatty and Gordon, 1991). | Entrepreneurial nature (Howell and Higgins, 1990); A strong need for achievement, willing to take personal risks for decisions, preferred decisions with a moderate degree of risk, interested in factual (Damanpour and Schneider, 2009). | Championing opportunities were shaped by company agenda &amp; in some cases had to be aligned with economic benefits (Markusson, 2010). The structured organisational context shaped the career paths of potential champions (Markusson, 2010). Champions can also influence their context, creating &amp; manipulating venues for their advantage such as establishing communities of practice for sustainable approaches. (Meijerink and Huitema, 2010). In Government agencies &amp; policy roles champions tend to be politically savvy using short term political windows of opportunity for long-term change (Hartley <em>et al.</em> 1997; Meijerink and Huitema, 2010). |</p>
<table>
<thead>
<tr>
<th>Knowledge, disliked routine work (Beatty and Gordon, 1991; Pinchot, 1985; Maidique, 1980)</th>
<th>In Government agencies strong bureaucracy can limit the acceptance of risk and hence tendency to innovate (Winistorfer, 1996).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link with transformational leaders Howell and Higgins (1990); House and Howell (1992)</td>
<td>Public sector organisations have unique features: need for public support, short-term political pressures, lack of incentive to innovate and funding restrictions (Damanpour and Schneider, 2009).</td>
</tr>
<tr>
<td>Technical know-how &amp; analytical skills (Beatty and Gordon, 1991)</td>
<td>Certain departments within an organisation may be particularly reticent to support an innovation, (Gattiker and Carter, 2010). The Purchasing department may be resistant to change (Min and Galle, 1997).</td>
</tr>
<tr>
<td>Strong leadership and managerial skills (Beatty and Gordon, 1991).</td>
<td>The champion needs to understand how the innovation fits within the organisational context (Howell and Boies, 2004, p.124).</td>
</tr>
<tr>
<td>The champion must have a broad knowledge and vision of their role within the organisation (Muford et al, 2002 in Howell and Boies, 2004, p.124).</td>
<td></td>
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</tbody>
</table>
### Table 8.2: Champion motivation

<table>
<thead>
<tr>
<th>Ch</th>
<th>Career motivation</th>
<th>Nature of motivation</th>
<th>Reason for taking public sector position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“Leaving a legacy of works that I felt have contributed to improving the lives of people.”</td>
<td>Altruistic</td>
<td>“The chance to make a difference to the local community.”</td>
</tr>
<tr>
<td>2</td>
<td>“I get my kicks if you like, up to the point of delivery of a project, some prefer the cut and thrust of contracts, I can do that, I can monitor contracts but I prefer getting the project up to the point of delivery.”</td>
<td>Challenge-oriented</td>
<td>“It was the first full time post that I was offered and they paid for my education.”</td>
</tr>
<tr>
<td>3</td>
<td>“I don’t have any major goals. I just like to do well with the projects I take on and being a born and bred Fifer I like to think that my work has made a positive contribution towards Fife as a whole.” “…..throughout my career I have had a strong interest in the efficient use of energy which was one of my motivations for pushing forward with the district heating projects.”</td>
<td>Altruistic</td>
<td>“I Wanted away from a job where I was regularly on call.”</td>
</tr>
<tr>
<td>4</td>
<td>“To make a difference and contribute to sustainable development whilst earning a living wage.”</td>
<td>Sustainability Pragmatic</td>
<td>“The chance to make a difference to the local community.”</td>
</tr>
<tr>
<td>5</td>
<td>“I am impassioned about the effective delivery of sustainability in its widest sense. The goal of biodiversity, social diversity and economic diversity is something we all have a role to play in. Those of us in a position of influence or control have a responsibility to minimise exclusion in any form within our communities, between them and through the generations to come. I believe that this should be delivered within realistic business and financial constraints.”</td>
<td>Altruistic Environmental</td>
<td>“The chance to progress the environmental agenda.”</td>
</tr>
<tr>
<td>6</td>
<td>“Making a difference”</td>
<td>Altruistic Civil-Minded</td>
<td>“The chance to serve the public.”</td>
</tr>
<tr>
<td>7</td>
<td>“Supporting my family, having enough money to retire and enjoy life outside work, retaining a good work/life balance,” and also social &amp; environmental goals, “Making a positive social and environmental impact, working in and to improve my local area.” “Developing projects from scratch and seeing them built/added to the city fabric, seeing a strong and clear connection between my efforts and the outcome (i.e. often activities at work are several steps removed from the final outcome).”</td>
<td>Private life concerns Altruistic Environmental Achievement</td>
<td>“The chance to make a difference to the local community.”</td>
</tr>
<tr>
<td>8</td>
<td>“Always been motivated by big picture issues – i.e. reducing carbon emissions to tackle climate change and a desire to see a better society.”</td>
<td>Environment Altruistic</td>
<td>“The chance to progress the environmental agenda.”</td>
</tr>
<tr>
<td>9</td>
<td>“Making a real difference... I have to believe in what I’m doing, profit doesn’t motivate me”</td>
<td>Altruistic Non-monetary</td>
<td>“I wasn’t concerned about which sector - public, private or independent. It was the job itself that attracted me as it matched my interests in both environmental and social issues.”</td>
</tr>
<tr>
<td>Page</td>
<td>Text</td>
<td>Theme</td>
<td>Altruistic</td>
</tr>
<tr>
<td>------</td>
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<tr>
<td>10</td>
<td>“I suppose I would like to see people really benefitting from sustainability in a mainstream way, not as a hair shirt and lentil issue, but as something they can benefit from financially, economically socially and environmentally.”</td>
<td></td>
<td>Sustainability Altruistic</td>
</tr>
<tr>
<td>11</td>
<td>“I always tend to challenge myself and get easily bored of the routine and same old stuff, so always on the look for the next challenge. This can be frustrated quite quickly in the public sector when obstacles tend to come from all directions, however I take a view that this makes the challenge all the more rewarding often keeps me sane. So I guess work stimulation is the key driver.”</td>
<td>Challenge-oriented</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>“I always wanted to be captain of the ship.”</td>
<td>Leadership Altruistic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td>Motivation</td>
<td>Value</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>13</td>
<td>“I would like to leave the place better than I found it it’s my weakness, we all have strengths and weaknesses, mine is I see something and want to help make it better.”</td>
<td>Altruistic</td>
<td>“Opportunity to gain qualifications at no personal cost whilst working.”</td>
</tr>
<tr>
<td></td>
<td>“It goes back to my childhood money was a big issue, profit was what it was all about, now I don’t care at all about it,”</td>
<td>Non-monetary</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>“Make a difference a positive impact, leaving a legacy, doing the right thing, whether that’s in an organisation, city or bigger.”</td>
<td>Altruistic, Civil-minded</td>
<td>“The chance to serve the public.”</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Pragmatic</td>
<td>“Originally it was another job to pay the bills.”</td>
</tr>
<tr>
<td>16</td>
<td>“I enjoy problem solving, design and drawing.”</td>
<td>Problem-solving</td>
<td>“It’s just another job to pay the bills.”</td>
</tr>
<tr>
<td>17</td>
<td>“In those days it was to become Director of Finance and then Chief Executive, however one of my several values has been a keenness to improve the environment and people’s quality of life.”</td>
<td>Civil-minded</td>
<td>“Chance to serve the public.”</td>
</tr>
</tbody>
</table>
### Table 8.3: Champion career paths

<table>
<thead>
<tr>
<th>Champion</th>
<th>Types of Org.</th>
<th>Skills/Experience</th>
<th>Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Public sector</td>
<td>Problem-solving</td>
<td>“The programme was in chaos and I managed to reorganise it making it realistic and cutting costs although the architects were not too happy.”</td>
</tr>
<tr>
<td></td>
<td>Private sector</td>
<td>Capital Engineering projects</td>
<td>Responsible for developing an education capital programme when working for the Department of Design and Technical Services.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Willingness to go outside of comfort zone</td>
<td>“I had always wanted to work abroad.”</td>
</tr>
<tr>
<td>2</td>
<td>Public sector</td>
<td>Project Championing</td>
<td>Comfortable with disrupting status quo</td>
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<td>----------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“I fell out with the upper levels of management (mainly Aussie civil servants)....”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“…I managed to reorganise it making it realistic and cutting costs although the architects were not too happy.”</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Established own business</th>
<th>Project Management</th>
<th>Project Champion, Regeneration.</th>
</tr>
</thead>
</table>

“I managed an improvement programme that saw the Birmingham Museums transformed for the first time in decades”

Head of Project Management, Birmingham City Council: “I lead a team that attracted...”
multi-million pound grants to enable the delivery of these schemes. I was also responsible for Facilities Management for the extensive listed building portfolio and all the City’s Public Art portfolio. I also had extensive involvement in Trust development, business planning, org. change & service delivery.”

<table>
<thead>
<tr>
<th></th>
<th>Public sector</th>
<th>Technical experience of DH systems</th>
<th>“I had experience of large steam distribution systems on large hospital sites and experience of large medium temperature hot water distribution systems.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Public sector</td>
<td>Technical experience of DH systems</td>
<td>“I had experience of large steam distribution systems on large hospital sites and experience of large medium temperature hot water distribution systems.”</td>
</tr>
<tr>
<td>4</td>
<td>Public &amp; Voluntary sector</td>
<td>First-hand experience of social problems</td>
<td>Champion 4 worked has worked in the charitable and voluntary sector firstly working on</td>
</tr>
</tbody>
</table>

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| 5 | Public & Private sector | Broad environmental knowledge base. | Worked as an Environmental Consultant: “I could cover anything and everything remotely environmental.”
   | Development of innovative solutions for FP. | Home Energy Officer for Fife Council, “In Fife we trialled various domestic renewable. I had a |

Established own business in community development, this role involved providing welfare rights advice to tenants on a Council housing estate. He then took a position with the National Energy Action (NEA) charity dealing with Fuel Poverty issues.
| 6 | Employed in same LA whole career | First-hand experience of social problems. | programme of solar HW installs (tubes and plates). I also managed a project installing GSHP (horizontal and vertical collectors), ASHP and exhaust ASHP. The heat pumps had a significant impact.” |

| 6 | Employed in same LA whole career | Project Management Writing & securing bid funding | “I joined Dundee City Council in 1986 as an Area Housing Assistant, progressed through promotion to Programme Development Officer (renamed HECA Officer).” |

| | | Familiarity with the operation of local government in Scotland (particularly in relation to Housing, Energy Efficiency and Sustainability) and understanding | |
of the roles and spheres of influence of other sectors on it – including central government, business and voluntary sectors.

<table>
<thead>
<tr>
<th>7</th>
<th>Private sector Charitable sector Established own business</th>
<th>Project Management</th>
<th>Environmental Charity post: “…project managing mixed-use low carbon and commercially focused developments in London and Sheffield.”</th>
<th>Sustainability Advisor to the International Broadcast Centre project.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Public sector Private sector</td>
<td>Sustainability issues</td>
<td>Champion 8 has worked as a Climate Change Coordinator and in a Managerial</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>position for the European Environment and Sustainable Development Advisory Councils (EEAC).</th>
</tr>
</thead>
</table>
| 9 | Private sector | Tenacity | “I hated the job, but I need an income.”  
<p>|   | Public sector | Open-minded | “…any experience is good experience.” |
|   | Established own business |   |   |
| 10 | Willingness to go outside of comfort zone |   | “I always wanted to travel – had lots of missionaries traipsing through our house growing up, and wanted to see the world. Fascinated with South America so went there! Life changing experience to see the challenges some people face and in your face inequality and racism.” |</p>
<table>
<thead>
<tr>
<th>11</th>
<th>Established own business</th>
<th>Project Management Leadership</th>
<th>&quot;While working for the University, I had extensive experience of managing in a multi-disciplined Facilities Management environment. This included significant organisational and operational responsibilities, creating strategic change for service improvement. My leadership skills were quickly recognised, allowing me to progress within the organisation before leaving to join BCC for career progression.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Public sector Established own business</td>
<td>Technical knowledge Providing innovative solutions</td>
<td>&quot;I am a specialist in controls and in their application. One of my earliest achievements after coming to Barnsley was the pioneering of the...&quot;</td>
</tr>
</tbody>
</table>
‘Airless Kindle’ of Solid Fuel Boilers which served to demonstrate that coal could be better and more properly controlled and thereby economic in use. Primary fuel savings around 40% become the norm after my methods were applied.”

<table>
<thead>
<tr>
<th>13</th>
<th>Private sector</th>
<th>Generalist rather than specialist</th>
<th>'I’m an accountant not a techy I have a veneer level knowledge of most subjects, not too deep’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public sector</td>
<td>Finance acumen</td>
<td>“I was always good at numbers.”</td>
</tr>
</tbody>
</table>

<p>| 14 | Public sector  | Sustainability Leadership Contracts | Environmental Projects Manager post, Leeds Metropolitan University: “developing a comprehensive environmental    |
| Communication &amp; Stakeholder Management | programme focusing on energy management, waste contract procurement and management and a campus wide travel plan as part of a long term strategy for redevelopment of the city centre and campus sites. Responsibilities included designing and implementing awareness campaigns and working closely with the Student Union and local community groups. |
| Environmental Management post, University of Sheffield: “I was responsible for managing interface with key stakeholders in the local community, the funding council, NHS |</p>
<table>
<thead>
<tr>
<th></th>
<th>Public sector</th>
<th>Environmental issues-broad</th>
<th>Prior to working for the LA, Champion 15 worked as an Environmental Consultant dealing with aggregates &amp; waste.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Private sector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Public sector</td>
<td>Design skills</td>
<td>Champion 16 has considerable LA experience; he has 37 years’ experience in Building Services.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering and technical</td>
<td>He has worked on a number of heating system projects in hospitals &amp; universities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technical experience of DH systems</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Public sector</td>
<td>Finance Leadership</td>
<td>Director of Finance role.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Management</td>
<td></td>
</tr>
</tbody>
</table>