How can financial firms 'go green'? –

'*Seeing the Elephant' and leading it in the right direction*

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The research question of the paper is *How can financial firms go green?* Firm wide changes in policies, focus, organization, knowledge, and technology are needed to support a shift to green financial practices. This change in banks, fund managers, insurance companies and other financial firms is at the heart of green finance, its role in green economy changes, and rapid responses to significant risks of climate change. This involves purpose led change in complex systems in firms and comprises significant problems of understanding and action in practice and academe.

Complexity must be addressed to manage change and problems. This requires a knowledge strategy (Zack, 1999) to close knowledge gaps in practice and academe. Complexity is addressed by using connected holistic views from empirical research and theoretical analysis. The latter are combined in a conceptual framework or Green 'Behavioural theory of the financial firm' (green BTTF). This adapts Holland's (2016, 2017, 2018, 2019b) "Behavioral Theory of the Financial Firm" to a climate change setting.

Field and archival research are used to reveal the main elements, connections, and interactions, in the case financial firms as complex socio-technical systems (Mitleton-Kelly (2003), as they pursue Net Zero aims. The focus of this empirical narrative is on green change in nonfinancial aspects and how this changes financial activities. The empirical themes are explained in broad metaphor terms (Morgan, 1997) whereby the financial firm socio-technical system consists of three non-financial elements or 'Head', 'House', 'Community', and a financial 'Machine' element. These constitute a four-part empirical green change narrative.

Systems theory, Cyert and March, and Bourdieu's idea are used as complementary theory means to *further* develop a holistic view of the phenomena. A range of specialist theory and literature is used within these overarching frames to explain each part of the empirical phenomena. This interdisciplinary approach (Knights and Willmott, 1997; de Bakker et al, 2019) is adopted to interpret the empirical change narrative and develop an equivalent theoretical narrative. These narratives form the green BTTF.

This knowledge strategy (Zack, 1999) directly addresses issues of uncertainty and complexity by closing, *in part*, the knowledge gap (Holland, 2010) between, what academics and practitioners know about the greening of financial firms, and what they need to know. It reduces problems; of partial explanatory narratives, fragmented thinking, and uncoordinated action; in these complex systems. It reduces knowledge risks historically faced by financial firms (La Torre, 2020) operating as complex systems facing major change. The enhanced empirical and theory understanding supports development of an academic research programme about 'Green Finance' using a range of non-finance academic disciplines. It can encourage a rethink of research and theory development in the field of finance (Gendron, & Smith-Lacroix, 2013)

This holistic narrative approach has potential 'to make a difference' in; researching, learning, thinking, and believing about desirable actions and responses to climate change (Shiller, 2019; King and Kay, 2020) in financial firms and wider systems. These are part of the evolving means to realign value in financial markets with values of wider society (Carney, 2020).

Key words: Financial firms, Climate change, Complexity, Conceptual frame, Intangibles, Dynamic Capabilities, Behaviour, Integrated thinking, Decisions.
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Structure of the paper

Section 1 discusses the Research question and reasons for paper. It notes problems of understanding financial firms and climate change. Knowledge gaps arise in practice and academe. Collaboration amongst financial firms is reducing knowledge gaps, but significant problems remain for individual firms. This section argues for the development of a conceptual framework for financial firms based on empirical and theory sources. This is a means to answer the research question, understand the complex system, and close knowledge gaps. It is a way to develop integrated thinking and responses to climate change. Section 2 on research methods outlines sources of data and use of qualitative methods to understand: the 'soft' infrastructure of financial firms; its role in operational activities; and how these are focus of green oriented change.

Section 3 provides a "sneak peek into the investigated scene" (Locke, 2001, p. 121) as empirical and theoretical narratives. This presents an outline of the conceptual framework or 'green behavioural theory of the financial firm' (Green BTFF) as integrated empirical and theoretical narratives. This provides insights into the power of an interdisciplinary theoretical interpretation concerning how case financial firms learn and change their functions and activities over time. This seeks, in part, to close the **academic knowledge gap** identified in the paper.

The empirical narrative is outlined in more detail in section 4 and provides many insights into the richness of the empirical data. This provides means to close the **practice knowledge gap.** *It is presented into* ***four*** *parts to communicate the underlying complexity in a clearer form. The parts concern* green oriented changes: at the top ('Head'); in socio-technical context and mechanisms ('House'); in interactions and working conditions ('Community'); and in behaviour and decisions in the financial 'Machine' relative to Net Zero aims.

Section 5 explores how the approach in the paper has potential 'to make a difference' in learning, research, thinking, discussion, and action when facing complexity and uncertainty arising from climate change. Section 6 outlines the conclusions.

1. Introduction

Section 1 discusses the Research question and reasons for paper. It illustrates the complex change process in financial firms facing climate change. It notes problems of understanding financial firm, as significant knowledge gaps in practice and academe. Collaboration amongst financial firms is reducing knowledge gaps, but significant problems remain for individual firms. This section argues for the development of a conceptual framework for financial firms based on empirical and theory sources. This is an embryonic means to answer the research question, understand the complex system, and close knowledge gaps in practice and academe in complementary ways. It is a means for financial firms to develop integrated thinking and responses to climate change.

1.1 Research question and reasons for paper

The research question of the paper is *How can financial firms go green?* Or in expanded terms - How can the whole financial firm - *in the form of combined human, organisational, technological, and financial resource*s - develop an integrated and coherent response to climate change? The green financial firm as part of a green finance change is a key lever to move the world and its climate to net zero conditions, where carbon emitted and the amount removed from the atmosphere, are equal. The green financial firm and its positive impact on climate change, is part of the means to protect and restore nature and its biodiversity, and vice versa.

The research question reflects the increased significance of the non-financial purpose of financial firms, and the extensive changes in non-financial resources (sociotechnical, knowledge) and financial resources required as the financial firm goes green. This reflects a **firm-wide hypothesis** (Poterba, 2021) about change required in green finance. This concern changes in complex systems in firms and comprises significant problems of understanding and action. Complexity must be addressed to develop integrated thinking about change and to manage change and problems. This requires dealing with knowledge gaps in the field of practice and in the field of academe *due to the complexity and rapidity of climate change.* The knowledge gaps (Holland, 2010) concern what financial practitioners and academics know, and what they need to know (Zack, 1999), when making decisions, when investigating rapid and complex change, and when evaluating responses. This paper aims to close these gaps and investigate how financial firms such as banks, fund managers, insurance firms, pension funds and others, adapt and respond to climate change.

The financial firm intermediates sources of funds to create new uses of funds. The firm transforms risk, liquidity, size, and maturity of funds to provide financial services, products and functions required in real economy and society

(Lewis & Davies, 1987; Buckle et al, 2011). Financial firm's conventional purpose and function has been to deliver specialist financial services within their 'philosophy'. For example, fund managers such as Schroders are 'value investors' taking a long-term view on investee companies as the basis to deliver the investment services required by clients. Banks such as NatWest intermediate between their fund suppliers (retail, wholesale depositors) to supply payment, lending, and other services. Insurance firms such as Aviva promise to insure customers against risk, reimburse them when they occur, in return for 'premiums', and invest the premiums to secure returns.

Given the widespread recognitions of the risks from climate change (see below) these firms are adapting their traditional financial purpose, function, and philosophy, to change financial decision activities and products to reflect climate change risks and sustainability aims (GFANZ, 2021). This involves a complex change process in financial firm intangibles such as organisation, culture, and knowledge. It involves major changes in the impact of this non-financial context on the use of financial resources in the financial firms.

The physical risks of climate change are widely recognised and there are intense global political pressures to reduce greenhouse gases (GHGs) by setting targets and agreeing commitments to reduce GHG emissions to Net Zero. The latter refers to reducing GHGs such as methane (CH_4) and carbon dioxide (CO_2) to a minimum and offsetting what is left. The IPCC report (2021) emphasised that human action was unequivocally the cause of climate change. Climate change was widespread, rapid. and intensifying. Because tipping points become more likely at 1.5 °C, this is now considered an upper limit. The UN member states approved the IPCC report (August, 2021). This is the basis for governments to agree Net Zero targets at COP26 in Glasgow (November, 2021), to keep within the 1.5 °C upper limit. Reduction of methane (CH_4) is the immediate short-term GHG priority to 2030 and continuing reduction of carbon dioxide (CO_2) to 2050. If emissions across the world hit net zero by 2050 then keeping below 1.5 °C is feasible, if difficult. The combination of physical risk and increasing political agreement on desired actions from IPCC (2021), intensifies transition risk for societies, economies, and firms.

Keeping below 1.5 °C requires huge sums to be financed and invested (Lanberg et al, 2018). Financial firms ability to secure and allocate funds, and manage financial risks, are recognised as an essential in response to climate change risks (UNEP, 2015). There is a need to align financial firms with sustainability aims (Paris COP21, 2015; UNEP, 2016, 2017; EU, 2018) and for them to influence the 'real economy' and respond to global society concerns. There is a need for a dynamic response as the green agenda develops from Paris COP21 (2015), UN SDGs (UNDP, 2016), Net Zero, to Glasgow COP26 (2021). There is need to reflect the deep connections between climate change and attempts to protect and restore nature and its biodiversity (Net Zero Nature, 2021: TNFD, 2021).

1.2 Problems of understanding financial firms facing climate change.

Significant change is required in financial firms and their specialist roles to make them 'green-oriented' and responsive to problems. Knowledge gaps concerning financial firms arise due to the complexity and rapidity of climate change. These arise in the field of practice in finance community and individual firms. Collaboration seeks to reduce these, but gaps remain with individual firms. Knowledge gaps also arise in the field of academe. The paper argues for development of a conceptual frame to solve these problems in a complementary way.

1.21 Knowledge gaps in financial firms and the finance community

The GFC revealed historic knowledge gaps in the field of practice and in the field of academe (Gendron et al, 2013). Before the GFC, networked finance professionals making up 'finance society' (Holland, 2017), were infused with finance values and norms. Academics were focussed on conventional finance theory and practitioners accepted these

ideas to justify how they valued transactions and to explain efficient functioning of markets (Turner, 2009). In the GFC, both practitioner and academic areas of knowledge failed (Turner, 2009; Holland, 2010).

Serious problems arose with a much wider range 'soft' socio-technical factors deep within the firm (Chen et al, 2014. 2018; Holland, 2010, 2016, 2017, 2019). They occurred in social areas (governance, culture, hierarchy control etc) as well knowledge in top teams and employees and contributed to problems in financial decisions. Cases such as RBS (NatWest) before and during the GFC, (2008) and Wells Fargo (2010-2016) illustrate how 'soft' failures in non-financial context creates many problems with 'hard' financial resources and disclosure. This contributes to markets failing to hold firms accountable. Underplaying the complexity of financial firm systems has been a factor in historic problems of change in financial firms.

Practitioners continue to face knowledge problems due to climate change (Harrison, 2019, 2020; Rose, 2020). In the field of practice, knowledge gaps continue to arise at the level of the firm and at the level of the finance community. In the firm this concern the ability to use specialist knowledge and capability to manage conditions of rapid change such as physical climate change and transition risks. In the wider finance community this concerns developing shared knowledge about what green finance means, what green products are, and what shared activities and practice can support Net Zero aims and financial firm functions. These two levels of knowledge in the field of practice are closely linked. Community wide knowledge of shared and agreed practice creates a 'level playing field' and defines 'rules of the game'. This supports the creation of firm specific knowledge and practice, with firm specific knowledge providing new insights for the community. Both face deficiencies in their green dimensions. The problems of complexity and rapid change facing individual firms has promoted much collaboration in the finance community to close both gaps. It has also promoted much change in the individual case firms to close knowledge gaps in their top teams and employees.

Collaboration and closing knowledge gaps in finance community field of practice

Belchambers (2021) argues that given this complexity and uncertainty facing many financial firms and their top teams, much more co-operation and collaboration is required in the field of finance to increase the chance of success when responding to climate change. Such collaboration on banks collective action on climate is essential given the likelihood of considerable variation possible between financial firms on strategic change. Zimmermann (2019) found such variety in German banks in sustainability strategy content. She argued that this was caused by varying motives such as 'business and environmental reasons, and different sustainable practices'. The achievement of finance industry targets for change will not be achieved unless this variety is set within a wider agreed frameworks and action plans.

Shen et al (2016) find that banks that are corporate socially responsible (CSR) (including climate change), overwhelmingly outperform non-CSR banks in terms of return on assets and return on equity. This suggests that those banks that collaborate on the climate change component of CSR and its social and economic impact, are more likely to create additional financial value than those who do not collaborate.

Much collaboration has emerged since Paris COP21 (2015) and the development of the UN SDGs (UNDP, 2016). Collaboration is now explicit and is being formalised. As Child (1972) notes `strategic choice' in the firm typically includes not only the establishment of structural forms for individual firms 'but also the manipulation of environmental features and the choice of relevant performance standards'. The latter has taken the form of a political process of change in which large financial firms are extensively involved. Practitioners, regulators, the EU, UN, and national bodies are seeking to develop a body of 'knowledge of practice' to enable financial firms to respond to climate change. *For example, this includes:* Principles of Responsible Banking or PRB (2017-2019) to define common expected behaviours; and a Green taxonomy (EU, 2020) defining common terms and language. It includes attempts to create

shared understanding and standards: for the pricing of carbon (World Bank, 2020), and for green disclosure such as the TCFD (Bank of England, 2017).

Collaboration is also reflected in major finance community initiatives. These include the Sustainable Markets Initiative (SMI) Insurance Task Force, convened by the Prince of Wales, and chaired by Lloyd's, and made up of executives from many of the world's largest insurance and reinsurance firms. Collaboration includes the Glasgow Financial Alliance for Net Zero (GFANZ, 2021), chaired by Mark Carney, bringing together over 160 of the world's largest financial firms to accelerate the transition to net zero emissions by 2050 at the latest. These changes are front loaded to interim 2030 emission reduction targets with high GHG clients and sectors. This links together alliances for net zero banking (NZBA), net zero asset managers (NZAM), and net zero insurance alliance (NZIA). GFANZ, (2021). It requires that all

'GFANZ member alliances must be accredited by the UN Race to Zero campaign. They must use science-based guidelines to reach net zero emissions, cover all emission scopes, include 2030 interim target setting, and commit to transparent reporting and accounting in line with the UN Race to Zero criteria'.

For financial firms and corporate customers, developing this 'knowledge of practice' is intended to clarify the co-operative framework in which they can make co-ordinated and similar green decisions about capital allocation and individual transactions to achieve collective net zero aims. They can then use their specialist and unique 'knowledge of practice' within the shared community knowledge and aims, as a basis for competing on, securing, and supplying this business, and creating financial value.

The climate change debate is deeply connected to attempts to protect and restore nature and its biodiversity (Net Zero Nature conference, 2021). Dasgupta (2021) calls for changes in how we think, act and measure economic success to protect and enhance our prosperity and the natural world. Reducing greenhouse gases can contribute to nature, as well as more direct action to support nature. Support for nature can further reduce GHGs, demonstrating the symbiotic relationship here.

The above attempts to develop a body of shared 'knowledge of practice' reveal the rapid growth from 2015 onwards in understanding in the 'finance community' and wider society of how climate change risk is a major source of financial risk and value, and a major ethical and social change issue. This shared knowledge sets the 'rules of the game' for all 'players' in the field of finance.

Despite the above collaborative activities, Belchambers (2021) noted that many participants at City Week (2021) raised issues of collaboration in and between firms, between regulators, and between governments. This reveals the currently incomplete, attempts to create a widely understood framework for collective change by intergovernmental bodies, governments, regulators., financial firms, companies, and others. All parties recognise that complexity they share must be understood and acted on in a shared way but face problems of co-ordination and different world views, ideologies, goals, cultures, and professions. These problems at world and finance community levels, impact on problems at financial firm levels. Belchambers (2021) suggested that, given the significance of this issue, collaboration be analysed by G20, and barriers removed to drive forward the green change process in finance.

Unique knowledge gaps remain in financial firms - invisibles, visibles, and uncertainty.

Despite the above collaborative efforts to develop community wide knowledge, practitioners continue to face unique knowledge gaps and problems at the level of individual financial firms. The knowledge gaps arise because of complexity, rapid change, and uncertain future. They arise due to their unique resource and product-market positioning in this complex change process. These conditions impair top team cognitive capabilities (Lejarraga, Pindard-Lejarraga,2020) and foster 'muddling through' (Lindblom, 1959) behaviour specific to each firm.

It is difficult for practitioners to develop a holistic view due to the rapid and complex climate change processes, and problems of explaining and managing change in financial firms as complex systems (Mathews, Net Zero Finance Conference, 2021). Chief executives such as Harrison (2019, 2020) of Schroders and Rose (2020) of NatWest tend to focus their *public* discussion on the main 'visibles' such as metrics for supply of green transactions. They discuss 'invisibles' or 'soft' factors such as culture or leadership in a fragmented and partial way in response to current circumstances. The narratives about 'soft' intangibles are normally developed in *private* meetings between top teams and shareholders (Holland, 2017, Chen et al 2014, 2018).

In addition, the agenda keeps developing, with increasing evidence of the causes of climate change (human actions) and the potential for sudden change occurring in the climate (IPCC, 2021). Biodiversity has increasingly been closely linked to climate change issues, and financial firms face increasing demands to recognise biodiversity issues (TNFD, 2021). Larsen at the Ethical Finance Summit (June 9th 2021) argues that bankers may not have the 'head space' or cognitive capabilities to deal with this and may struggle to deal with nature-based risks as well the climate change and CSR issues. Mathews, (Net Zero Finance Conference, 2021), argued that is never possible to fully understand this complexity and rapid unexpected change. There is no perfect climate change transition plan for a financial firm because it not feasible to know exactly what is going to occur and how to respond.

Nevertheless, the collaborative efforts in the finance community and worldwide have made it clear that it is possible and necessary to develop strong anticipatory and environmental scanning elements. It is possible to develop a credible plan and show commitment and ambition to make changes. It is possible to show reliable evidence over time and develop a track record. It is possible to share knowledge and agree on collective actions. These problems of processing information during uncertain climate change and the focus on subsets of key factors in the financial firm, reveal 'information overload' and limits in cognitive abilities of individuals in top teams. They reflect Simon's (1957) ideas of 'bounded rationality' and satisficing' and use of heuristics. Collaborative processes by individuals in top teams, and with peer groups in the finance community identify heuristics for green information search and appropriate behaviour and decision making. These contribute to an enhanced 'ecological rationality' or more robust heuristics (Lejarraga, Pindard-Lejarraga,2020) and reduce information overload and dysfunctional behaviour for firms. However, much uncertainty remains.

The collaborative process, in and across specialist finance sectors, has a strong emphasis on commitment to actions on 'visibles' in the form of new green products, measurable outcomes, and net zero impact. The public debate and political process about green oriented change in financial firms has focused finance community and financial firm attention on how 'hard' metrics, targets, financial products, allocation of capital, and influence on customer decision making, could be changed consistent with climate change aims especially Net Zero by 2050 or earlier. Thus current 'community' thinking and responses to climate change in financial firms is biased towards 'visibles' of immediate concern. A limited set of high-profile 'soft' or intangible factors such as governance (BCBS, 2015), and culture (Bogan, 2018), are being addressed, but in single factor way.

In financial firms this underplays potential problems with the full set of socio-technical and knowledge factors (or 'soft' or non-financial dimensions), how they are integrated, and their collective negative impact on use of financial resources. These less visible social and knowledge factors are sources of potential problems such as slow progress on change, hypocrisy, deceit, and biased disclosure (Brunnsson 1989; Holland, 2010, 2019a,b). The non-financial dimensions to the firm are critical to producing desired green outcomes, both invisible and visible. They cannot be overlooked in a very vigorous public debate and political process dominated by new financial products, green targets and outcomes, and a small number of high-profile intangibles. They cannot be ignored in a world where financial firms

are subject to more scrutiny, where demands for transparency are increasing, where financial firm incentives (financial, social, environmental) are changing, and where stakeholders wish to value financial firm produced outcomes in financial, ethical, social, and environmental terms (Andrikopoulos et al, 2014; Cornett et al, 2016); Buallay et al, 2019). The above indicates that, despite improvements in finance community knowledge, thinking and action by individual financial firms facing rapid change and complexity, are likely to be constrained. Their thinking is likely to involve some degree of 'muddling through' (Lindblom, 1959) with a focus on a limited number of factors and their connections and interactions, relevant to current circumstances, civic society concerns and politics. They are likely to concentrate on where the firm believes it can act and achieve something, and where it can justify its actions. Firms are unlikely to reveal their problems in understanding complexity. Competitive concerns may limit their public narratives of change. In addition, networked finance professionals making up 'finance society' (Holland, 2017) may, despite efforts of a *growing* cohort of 'green' finance practitioners, continue to exercise strong finance values and norms over green change. These factors limit the public and private narrative and vision of change.

History suggests that these conditions will slow progress on change, and promote recurrence of problems, (Holland, 2010). They will delay or impede making financial aims subordinate to net zero aims. The potential for hypocrisy, deceit, and manipulation of disclosure, remains in such complex change situations. The unintended problems faced by managers and stakeholders are reminiscent of 'blindfolded men' sensing the nature of an invisible 'elephant' (Saxe, 1872), and are understandable given the complexity faced by these agents

The above reveals that a major practitioner knowledge gap remains. The debate must concern an integrated and explicit narrative of how many mutually supportive tangible and intangible factors in financial firms can go green in an integrated way. Thus, the debate must *also* address how the broader financial firm 'structure and engine' can adapt to expedite desired changes. This invisible 'elephant' must be made fully visible, to move it in the desired green direction.

1.22 Academic knowledge gap - and role of theory and related literature

A major academic knowledge gap also remains concerning theories of finance, organisation, and management. This has the potential to exacerbate the knowledge problems faced by practitioners and by academics. Despite the extensive criticism of finance theory post GFC (Turner, 2008; Gendron et al, 2013), there is very limited research by traditional finance academics on matters of substantive change in areas of public policy such as climate change (Diaz-Rainey et al, 2017; Hong & Scheinkman, 2020). Finance academics have yet to adapt the dominance of finance theory and financial aims to reflect this change process in finance. Finance theory does not reflect the major changes in finance phenomena concerning climate change, biodiversity, and corporate social responsibility.

This paper argues that the major change in purpose of financial firms and the growing subordination of financial value to wider social values (Carney, 2020) means that major theory knowledge gaps exist for areas such as shareholder wealth maximisation aims, valuation models, capital structure, and efficient market hypothesis (Turner, 2009). Theories of financial intermediation (Lewis and Davies, 1987; Buckle et al, 2011) continue to be relevant, but must reflect the new green purpose, decision, and information environment of the financial firm.).

Daddi et al (2018) notes that theories such as institutional and stakeholder theories have been widely used in studies on how firms change for climate change reason. However, the relation between business climate change strategies and other theories is unexplored. They recommend that a wider set of organization and management theories be used in Climate Change Studies. This paper also argues that a much wider set of non-finance theory and literature is required to explicitly reflect, the increased significance of the non-financial purpose and context of financial firms. A select group of authors have sought to use existing literature to extend the idea of the financial firm facing climate change. For

example, Buranatrakul et al (2017) developed a theoretical frame based on five variables identified in the literature, including management commitment, emissions reduction, product development, organizational involvement, and external relationship development. These were the basis to assess climate change strategic actions in banks. Raut et al (2017) evaluate sustainability in banks using four variables identified from literature and bank Balanced Scorecards. However, their literature base is narrowly conceived relative to the complexity faced by the case financial firms in world of climate change. This approach does not clarify wider set of the key factors and their connections and interactions in financial firms facing these problems.

1.3 Need for a conceptual framework and narrative to promote change. – closing the knowledge gaps

This paper argues that **complexity and knowledge gaps** in financial firms, finance community, and academia must be directly addressed. These must be addressed to understand how to manage change and reduce barriers to change. Collaborative activities in the finance community (Belchambers, 2021) reduce knowledge gaps and remove some of the uncertainty facing individual financial firms. However, this collaboration does not remove the unique risks and uncertainty faced by individual firms. The paper argues this situation creates the need for a conceptual framework *for financial firms* to answer the research question and understand the complex system. This must convey the essence of the system and change process, without being overwhelmed by the details of the complex system and its change process. The framework must not be more complicated than the phenomena being researched.

This requires a holistic approach to identify and connect many connected strategic change variables based on empirical research and theoretical analysis. This is needed to explain the extensive changes in sociotechnical, knowledge and financial resources as the financial firm goes green. It must show how green oriented non-financial resources alter the workings of the financial 'machine' to deliver green financial products and services. The paper does this by using theoretical narratives (section 3) and empirical narratives (section 4), (Golden-Biddle and Locke, 2007) concerning how the financial firm can become green orientated.

The paper also seeks to close knowledge gaps in academe. This is achieved by using a combination of Systems theory (Mumford, 2000), Cyert and March (1963), and Bourdieu's (1990) ideas to provide complementary holistic frames to interpret the empirical narrative. A range of specialist theory and literature is used within these overarching frames to explain non-financial parts of the empirical phenomena in the firm. This includes, inter alia, literature on organisational change, sociology, intellectual capital, and theory of the firm. This offers a means to develop conceptual connections to finance theory (Holland ,2019) to reflect climate change. This provides a way to exploit the many insights of finance theory about purely financial phenomena. This in turn, offers new ways for academic theory to influence behaviour and actions in the field of finance practice. The 'theoretical narrative' and its interpretation of the 'empirical narratives' (Golden-Biddle and Locke, 2007), in an interdisciplinary approach (Knights and Willmott, 1997; de Bakker et al, 2019), are the basis to form the overall conceptual framework as a 'Green Behavioural theory of the financial firm' (Green BTFF). This shared knowledge is part of the basis to increase collaboration and cooperation between practitioners, between academics, and between practitioners and academics. This conceptual frame is a means to close 'green' knowledge gaps in fields of practice (firm, community) and academe, and to close these knowledge gap in a complementary and integrated way.

2. Research methods

Aims

The paper uses qualitative research and theoretical interpretation to explain how financial firms can go green. In this research, "field-based stories" or "empirical narratives" (Golden-Biddle and Locke, 2007) are based on empirical findings about financial firms as they changed their socio-technical infrastructure to change use of financial resources

for Net Zero sustainability reasons. This field and archival research reveals the main elements, connections, and interactions in the financial firm as a complex system and in the green change process. Gendron and Smith-Lacroix (2013) defined investigating finance in action within context as

‘ [...] comprise the questioning of formal and rationalized accounts of practice, and the studying of the complex backstage of practice in its socio-organizational context. The dynamics of the work of finance practitioners and financial institutions and how it changes over time will also be considered‘.

Data sources

Two sources of data on financial firms are used. *Firstly*, public sources are used to develop detailed cases of change in six major financial firms in the period 2010-2021. These include three banks (NatWest/RBS, Lloyds, Wells Fargo), and three fund managers (Schroders, Baillie Gifford, Blackrock). *Secondly*, the author attended fourteen major practitioner conference (of 1 to 3 days length) as a basis to gauge change across many financial firms, and actively discuss the issues with practitioners. The practitioner conferences are at the heart of the practitioner and policy debate about change in green finance. They included Green Finance Summit (2017, 2018, 2019, 2020,2021); Ethical Finance Summit, (2018, 2019, 2020,2021), UKSIF (2018), City Week (2020, 2021), Net Zero Finance conference (2021). The data was primarily based on firms committed to Net Zero aims (GFANZ, 2021).

Much of the data is heavily normative and prescriptive, involving climate change believers and promoters of Net zero aims in a green finance world. The research is primarily descriptive in that it seeks to describe, explain, and critically appraise how financial firms are going green. However, given the global change context and author belief in climate change, it inevitably contains a prescriptive element. The study focusses on financial firms in their immediate customer and stakeholder networks but recognises the influence of the larger change context.

The change narrative covers periods of rapid change, and major problems and crisis from 2010 to 2021 with an emphasis on climate change. The Covid-19 pandemic (2020-21) was a novel source of insights. It showed how financial firms could rapidly re-organise their socio-technical infrastructures and working conditions in positive self-reinforcing cycles to deliver financial services during major unanticipated changes. Presentation of early versions of the paper at academic conferences such as CSEAR and BAFA provided many ideas from the academic community.

The case firms were chosen because they were publicly very active in arguing they were going ‘green’. Their experiences are expected to differ from those financial firms not changing, and from those that have been established as green firms from the outset. Much can be learnt from such comparisons. The case firms and paper thus provide insights for future comparative research. Each financial firm case illustrates many partial narratives about change in a few factors as firms are going green. These reflect an implicit narrative of many mutually supportive factors on how financial firms can go green. The financial firms all used financial intermediation processes to transform sources of funds for new uses of funds in the economy. Variation existed within case financial firms in term of specialist financial activity. They all made related changes to the ‘soft’ and ‘hard’ context to influence financial decision making. This multi-case design created opportunities for identifying common themes and differences across the cases (Yin, 1994). Four of the UK based financial firms (NatWest/RBS, Lloyds, Schroders, Baillie Gifford) had already been extensively interviewed by the author, on three separate occasions, during 1993 to 2017 and provided longer term context to the change process.

The research question of the paper is *How can financial firms go green?* The question focused on established ideas of intangible, tangible, and financial resources and how they were used in financial firms. The question focussed on green change issues. Multiple cases offered opportunities to explore how financial firms viewed climate change related events and how they developed their responses. This simplified the data collection and processing and provided a comparable

base across the cases. McKinnon (1988) and Stoner and Holland (2004) argued that such explicit strategies are required to counter threats to validity and reliability whilst collecting data in field studies.

Data processing and themes

Data processing sought to identify core empirical themes and their connections in wider patterns. Analysis of a range of cases was the basis to develop an 'empirical narrative' (Golden-Biddle et al, (2007) revealing links between the **common themes** identified for the financial firms, employees, and stakeholders. The themes concerned; changes in structure, mechanisms, process and interactions, internal working conditions, behaviour, decisions, communication and reporting actions and outcomes; as well as consequences and feedback.

The main phenomena or core code was 'Green change in financial firms' by individuals, in teams, in firms, and with many stakeholders. Core interaction categories concerned green oriented change in learning, purpose and performance metrics, socio-technical infrastructure, and financial activities of the financial firm, in response to climate change, forecasts of change, and pressures to change. They concerned the complex, mutual reciprocal interactions, and dynamics between these elements. They concern actively managing the interactions and dynamics, in positive self-reinforcing cycles, to achieve net zero and financial aims.

The change themes were manifest in cases as **four** change areas concerning green oriented changes: at the top of the firm ('Head'); to socio-technical context ('House'); to interactions and working conditions (in 'Community'); and to financial decisions (in 'Machine'). These, in turn, were connected in a larger change narrative. The change themes also concerned changes to communication (internal, external), reporting, and 'ongoing external engagement'.

These 'field-based stories' (Golden-Biddle and Locke, 2007) refer to empirical findings about changing 'socio-technical' processes, financial decisions, and financial intermediation processes in financial firms. Golden-Biddle and Locke, (2007) distinguish between 'field-based stories' and 'theoretical stories'. The empirical narrative provided a focus and structure for developing a theoretical narrative concerning financial firms. The 'theoretical story' was based on existing theoretical conversations in a field and identifies the area of studies 'to which researcher's grounded theorizing can make a contribution' (p122, Locke, 2001). The 'empirical narrative' and insights into the financial firm were interpreted using a focussed and interdisciplinary set of relevant literature to develop an equivalent 'theoretical narrative '(Golden-Biddle et al, (2007). The combined narratives form a 'green behavioural theory of the financial firm' (Green BTFF).

During data processing, case data and the emergent empirical themes and patterns interacted in iterative relationships. The processing of data and discovery of emergent empirical patterns were mediated by an analytic framework and prior grounded theory. They were mediated by use of new interdisciplinary resources (Knights and Willmott, 1997; de Bakker et al, 2019) based on ongoing debate and argument in the academic community. They were based on presentation of the paper at fourteen academic conferences from 2018 to 2021. They were mediated by debate and discussion in the practitioner community based on rapidly changing practice. They were mediated by author attendance and active engagement in fourteen major practitioner conferences (such as Green Finance Summits, 2017-2021; Ethical Finance Summit, 2018-2021). The theoretical and practical ways of interpreting the financial firm as a complex system, were based on concepts arising from differing experiences and perspectives. These were complementary and on occasion contradicted each other. However, collectively they offered distinct insights from the different perspectives and questions they brought to analysis of the common phenomena.

A previously developed '*finance oriented* behavioural theory of financial firms' (or '*finance* BTFF') (Holland, 2019b, 2018, 2017, 2016) was used to develop new insights. This paper on the Green BTFF constitutes an exercise in 'theoretical sensitivity' whereby new work allows the author to return to the original financial firm phenomena and data with a new perspective (Strauss and Corbin, 1998).

An *iterative* process of learning between data, constructs, prior research, and theory was the basis to develop a green oriented behavioural theory of change in the financial firm (Green BTFF). The green BTFF forms an embryonic conceptual framework to analyse climate change issues in financial firms and probe how they can go green. This involved as developing grounded theory in an iterative research process (Strauss and Corbin, 1998).

Thus this paper argues that the explanatory power of the empirical change narrative can be enhanced by interpretation in an interdisciplinary theory approach (Knights and Willmott, 1997; de Bakker et al, 2019). This is an alternative and complementary means to understand multi-faceted aspects of change in the financial firm complex system. Each part of the empirical change narrative (Head, house, community, machine) is interpreted by a brief theoretical interpretation from specialist and focussed literature. These are intended to be viewed within the more holistic view from - Systems theory, Cyert and March, and Bourdieu theory - conceptual frames. This overall analysis forms a theoretical narrative (Golden-Biddle and Locke, 2007). The combined narratives form the overall conceptual framework in the shape of the 'Green Behavioural theory of the financial firm' (Green BTFF).

The green BTFF and the theoretical analysis in the paper *are part of larger policy and academic debates about* the nature and purpose of the world of finance and financial firms. It complements an emerging stream of academic research and thought concerning this issue (Davis et al, 2016; Pitt-Watson, 2018; Kay, 2015, 2018; Mayer 2018) which challenges the current social contract between financial firms and civil society and is part of a larger academic debate about the future direction of capitalism (Collier, 2018). It is part of the evolving means to realign value in financial markets with values of wider society (Carney, 2020).

The green BTFF also reflects an emerging programme of field and qualitative research in finance which focuses on understanding how financial firms function and exploit expert knowledge in social and economic contexts. This includes Holland (1994), Hellman (1996), Holland and Doran (1998), Holland et al. (2012), Lord (2014; Chen et al. (2014, 2018), Coleman (2015) and Holland (2016, 2017, 2018, 2019b). In this approach, social context and expert knowledge in financial firms are recognised as key elements in financial decisions and financial risk management at transaction, portfolio, and firm levels. The green BTFF seeks to close the knowledge gap in academe by using an interdisciplinary approach to explain the empirical narrative. It seeks to connect these non-finance theory ideas to finance theory. This is part of the response to the problems of very limited research by traditional finance academics on matters of substantive change in areas of public policy such as climate change (Gendron et al, 2013; Diaz-Rainey et al, 2017; Hong & Scheinkman, 2020).

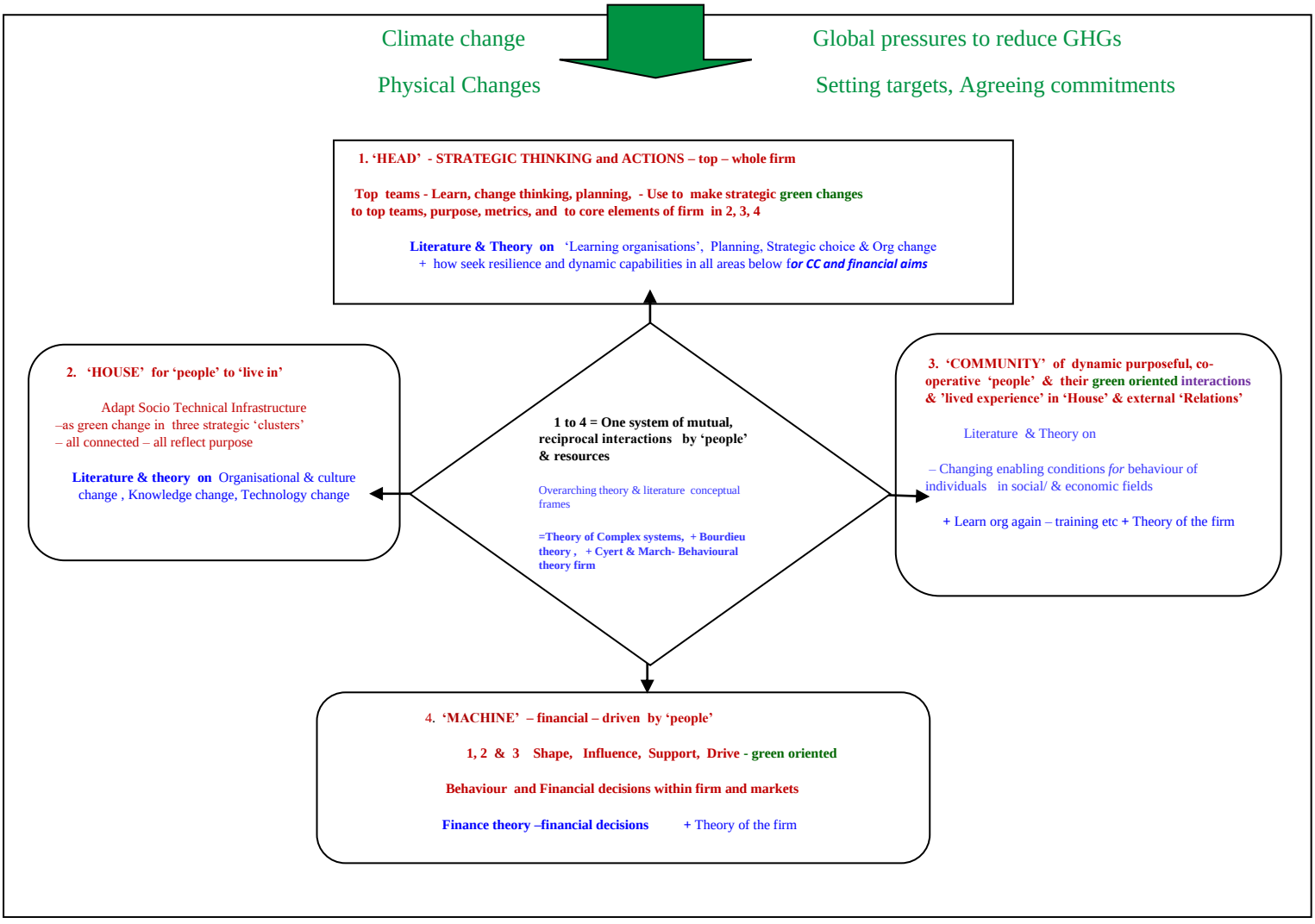
3. A Green Behavioural theory of the financial firm (Green BTFF) - A brief statement

The brief statement of the Green BTFF discussed below provides a "sneak peek into the investigated scene" (Locke, 2001, p. 121). This shows how the Green BTFF is based on a combination of insights from an "empirical narrative" interpreted within a "theoretical narrative". This provides readers with a simplified "map" to navigate the paper (Golden-Biddle and Locke, 2007). They provide an early overview of the richness of data in the *full* empirical narratives in section 4. They provide insights into the power of the *full* interdisciplinary theoretical interpretation of how case financial firms learn and change their functions and activities over time. Thus, complexity is addressed by using connected holistic views from empirical research and theoretical analysis.

Figure 1 illustrates the Green BTFF in schematic form. It outlines the major parts of the financial firm complex system. It identifies key parts of the empirical change narrative **(in red)** and theoretical narrative **(in blue).** This static and two-dimensional view does not capture multidimensional interactions between elements of the dynamic system over time. However, the empirical narrative provides a 'window' into these through a set of partial but connected narratives set within this frame. Quotes from the cases capture many more dynamic insights into the way individuals and teams comprehend and act on these system interactions. Theoretical interpretation provides ways to think about these dynamics.

The grounded theory structure for the empirical change narrative (Strauss and Corbin, 1998) is divided into four parts - as 'Head', 'House', 'Community', and financial 'Machine'. This provides means to communicate the essence of underlying complexity in clearer form. The integration of these in one empirical narrative provides a holistic and connected view of the phenomena. The empirical narrative and its four parts are the focus of theoretical analysis.

Figure 1 Green Behavioural Theory of the Financial Firm -- Theoretical narrative – based on empirical narrative



3.1 Empirical narrative for change - an overview

This section includes succinct summaries of insights from four major parts of the integrated 'empirical narrative' for change. These are discussed in more detail in section 4. In metaphorical terms (Morgan, 1997), *purpose led* changes in the 'Head' and 'People' resource elements lead to changes in 'House' and 'Community' elements and vice versa, and collectively they shape green oriented behaviour and decisions in the financial 'Machine' relative to Net Zero aims.

The first part of the change narrative involves top teams ('Head') 'looking out' to learn about external climate change. Top teams learn from other top teams and other members of elites in the financial community about uncertainty and complexity induced by climate change and its physical risks and by associated regulatory changes (transition risks). This involves collaborating in alliances within and across specialist finance sectors to understand change and develop the 'rules of the game'. It involves engagement with shareholders and other stakeholders. The activities involve 'looking in' and learning how to make changes in top teams ('Head') in terms of composition and capabilities of boards and executive teams.

In the second part of the change narrative -involves changes to the 'House'. Top teams use the green changes in their learning, understanding, and strategic thinking capabilities to 'look in' make green oriented strategic changes to purpose. and planning. This involves changes to 'socio-technical' contexts (Mumford, 2000; Mitleton-Kelly, 2003) influencing the use of financial resources. The socio-technical infrastructure ('House') consists of three clusters of strategic change. The first cluster includes changes to firm wide social and knowledge resources at both macro and micro levels. The second concerns green changes to control and influence mechanisms (culture, incentives etc). The third cluster involves green changes to technology. These changes are strategically matched to changes in the external environment (Teece et al., 1997) concerning climate change and the need to develop resilience in the face of uncertainty.

The third part of the change narrative concerns green changes in the financial firm 'Community'. This involves green oriented multidimensional **interactions** and 'lived experiences' by employees, *during* top down, bottom up, lateral, and network *organisational processes* in the 'Community'. The cases reveal how these interactions are used to exploit green changes at the top and to socio-technical infrastructure; and to mobilise mechanisms and technology. These in turn stimulate the green oriented interactions in the firm and networks. These changes and interactions collectively shape new enabling or working **conditions** and economic advantage.

The fourth part discusses how these 'soft' green changes influence the financial 'Machine'. The green changes to non-financial context, processes, and working conditions; support green oriented behaviour and drive financial decisions(single, portfolio, firm) in a financial 'machine'. They enhance green oriented analysis of stimuli, information production, and decision making relative to strategic aims in teams at all levels. They are the basis for transforming financial resources and delivering financial services relative to Net Zero.

The empirically based division into a four-part strategic change narrative provides a means to communicate the essence of underlying complexity in the change narrative in a clearer form. The integration of these in one empirical narrative provides a holistic and connected view of the phenomena. Each segment of the four-part empirical change narrative is supported by a brief theoretical interpretation using relevant literature. These are supported by Systems theory, Cyert and March, and Bourdieu's theory as complementary holistic conceptual frames for thinking about the phenomena.

3.2 Theoretical narrative for change

3.21 Systems view of the four-part change narrative

From the complex systems perspective, change in key elements – including 'head', 'house'. 'community' and 'machine' - are interdependent. Changes in one part of the system such as board structure, organisation structure or culture will have an impact on other parts such as product design or customer relations. As a result, the financial firm is an open system responding to many change pressures (Holland, 2016, 2019b). The system and its elements are characterised by purposeful processes, activities, and by feedback and learning.

At times, non-linear dynamics and interactions are unpredictable. They have emergence properties where actions of the whole are greater than sum of actions of parts (Holland J. H, 2014). *Multidimensional interactions* and actions of

individual agents and their teams, influence and create emergent macro and micro-structures and mechanisms. At the same time, macro and micro-structures and mechanisms of the complex system, influence individuals and teams and their interactions. As Mitleton-Kelly (2003) argues, change and the evolutionary process moves all the time between micro behaviours and emergent structures and mechanisms in the system, each influencing and recreating each other.

The four-part change narrative and cases illustrate that all parts of strategic change in the financial firm complex system (Mumford, 2000; Mitleton-Kelly, 2003) involve active learning (Pedler et al 1997) in the firm. They concern adapting the financial firm 'head', 'house', 'community' and 'financial machine' to be resilient and responsive (Teece, 2007; Souza et al 2017) to climate change and its risks. The four-part set of change narratives reveal the mutual, reciprocal nature of organisational dynamics: between contextual resources (structure and knowledge, mechanisms, technology), interactions and conditions, and decisions by individuals and teams; during strategic green change dynamics and operational activities. Ongoing interactions and dynamics are also used to adapt and sustain working conditions in more specific ways and shape green oriented changes in **everyday** behaviour of individuals and teams.

The change narratives show the mutual reciprocal interactions - as purpose led thinking and actions - at all levels in the firm and with stakeholders. They reveal how firms actively manage the mutual, reciprocal dynamics, in expected positive self-reinforcing cycles, to achieve net zero and financial aims. The change narrative includes 'contextual' or organisation wide change and 'measurement' change. Financial firms were seeking a subtle combination of, *'What we are (becoming) and what we are for, affects what gets done'* and *'What gets measured gets done'.*

Thus, the whole system and elements are viewed together during the four-part change processes. Integrated thinking skills, avoidance of silos, and shared understandings at all levels, are required to align everyone in the firm and whole system to pursue desired outcomes. This holistic view is intended to increase the chances of success.

Each sub narrative about change and each change in the integrated system has strong anticipatory and environmental scanning elements. They are viewed from quantified scenario analyses and qualitative 'envisionment' perspectives (Mikes, 2012), of future risks. The latter include connected climate change risks, biodiversity, social, and financial risks for long term (2050), medium term (2030) and short-term horizons (say from one year to 2025 ahead). They include scenario analysis for physical and transition risks and how they are interacting, in complex and immediate ways, potentially leading to 'tipping-points'. They include scenario analysis of how *to change now* to meet key staging points in 2025 and 2030, so the firms, their sectors, and the wider economy and society are set on the right trajectory to meet 2050 climate change outcomes. The 'jury is out' on whether this is being achieved by contemporary change activities.

3.22 Cyert and March's (1963) and the 'Behavioural theory of the firm'

Cyert and March's (1963) 'Behavioural theory of the firm' can be used to interpret the empirical narrative and develop a holistic view of the whole financial firm in a world of climate change. This theory highlights organisational decision-making processes by top teams with employees throughout the firm, and with other external stakeholders. Cyert and March (1963) argue that clearly structured organisational processes are means for uncertainty avoidance and conflict resolution in the firm. Organisational processes as *multi-dimensional social interactions*, are required to develop, allocate, mobilise, and exploit context-based resources (social, knowledge, technology, financial) in green oriented financial firms. The financial firm-wide organisational processes and context-based resources are integrated means for the firm community to cope with and reduce the uncertainty associated with green oriented financial decisions at transaction and portfolio levels (Hellman 2000) in the financial 'machine'.

The ‘Head’ as top teams and key external stakeholders, and to some extent employees and customers, participate in organisational processes to establish and agree green purpose and aims of the firm (goals). These concern agreements or compromises about pursuing multiple aims such as sales and profits, social responsibility, and Net Zero aims. Tops team or ‘Head’ make strategic choices about the financial firm ‘house’ in terms of allocation of resources (intangible, tangible, financial) in the firm infrastructure and their use in activities. Excess resources or ‘Organisational Slack’, beyond the requirements for operational activities and efficiency, are required for resilience in high-risk situations, to adapt to change, and maintain coherence of the firm.

The green oriented resources - intangible, technology, financial in the ‘House’, are the basis to collect and communicate green oriented information and change behaviour in the firm for Net Zero aims. The resources and information are used in decisions about production, products, customers, and market share. The informed organisation contexts (socio-technical infrastructure and its social and knowledge resources) are required to help individuals and teams make sense of equivocal messages, with a multitude of possible meanings in a rapidly changing information and decision environment (Weick et al, 1999).

Top teams or ‘Head’ make these decisions and communicate them to employee teams throughout the internal financial firm ‘community’ and to external groups. Conflicts may occur between these teams and individuals in ‘coalitions’ in the internal and external ‘community’ depending on their differing aims, priorities, and information. However, all key aims must be satisfied within a clear order of priority and weighting determined by explicit firm purpose. In a world of climate change, the high collaboration, and pressures for change in wider society and finance community are inducing climate change ‘believer’ firms to pursue Net Zero first, then social responsibility, then profits and financial value. These aims, priorities, and their expected interactions, are made explicit by ‘believer’ top teams in a clear statement of purpose.

In this world of complexity and rapid climate change, top teams experience cognitive limitations and exhibit ‘bounded rationality’ (Simon, 1959). Within the firm and with employees, and externally with stakeholders, this may lead them to ‘satisfice’, or seek ‘good enough’ outcomes, rather than maximising combined aims such as net zero and profit outcomes. The green resources are the basis to develop information on Net Zero, CSR, and financial consequences of decisions for the firm overall, employees, and stakeholders. This information is a necessary basis for making green oriented financial decisions in the financial ‘machine’.

However, firm specific strengths in green oriented socio-technical infrastructure, as well as in team and individual characteristics, are expected to play a role in uncertainty avoidance and conflict resolution in the team-based and goal-seeking task sequences or financial decision routines (Cyert and March 1963) of top team, middle management, and front-line teams. They ameliorate ‘bounded rationality’ and ‘satisficing’. They are also the joint base from which creativity can be stimulated in individuals and teams.

3.23 A Bourdieusien view of change - in the ‘system’ and its elements

Green change is about the exercise of power in the financial firm and external networks. Top teams, middle management and front-line employees exercise and experience power pressures to change. Bourdieu’s theory is used to characterise this process.

In Bourdieu’s theory, capitals are based on accumulated experiences in working conditions and are sources of power. They combine with habitus to determine employee practice, behaviour, and action in fields. Bourdieu’s (1984, p101) formula highlights the main concepts and their relationships as [(habitus) × (capital)] + field = practices.

Field, habitus, capitals, and power, play roles in the reproduction and adaption of social order for climate change. Dobbin (2008) argues that Bourdieu's framework integrates "a theory of the individual (habitus), a theory of social structure (the field) and a theory of power relation (the various forms of capital)".

Bourdieu's (1990) concepts have conventionally been used to explain how agents operating in social fields, act and reproduce their behaviours, and compete for information advantage and power through human, relational and reputational "capitals (Chen et al, 2018). Increasingly the existential threat of climate change has forced powerful agents in large financial firms and the world of finance to also use these capitals to collaborate, share their power and co-operate in new forms of shared green oriented practice.

In this paper the ideas apply to how external change and peer group co-operation between financial firm top teams ('Heads') on climate change risks is leading to adaptations to top team habitus and capital in external peer group fields. Top teams are also working with powerful stakeholders, such as regulators, governments or CSOs, and are developing a green oriented group habitus and capitals in external fields, as an extra green dimension their individual habitus and capitals. These changes are important influences on top team practice to develop green oriented strategic purpose and strategy for green change in their firms.

These changes in the 'Head' contribute to green oriented adaptations to habitus and capital of many other teams such as middle management, back office and front office in the internal financial firm field. Top teams use these to influence likeminded individuals working together in specialist decision teams in the firm's hierarchy, or with customers to develop green oriented group habitus and capitals in their shared social fields. The green changes in shared and specific capitals and habitus of individuals and of teams are critical to how they conduct **practice** (as strategic change and everyday activities) and interact with each other and with their shared fields. This leads to change in strategic practice as both 'Head' and the rest of the firm 'community' collaborate on green changes to the 'House' (socio-technical infrastructure), with these collectively leading to green oriented changes (strategic and everyday) in practices in the financial decision 'machine'. It contributes to new practices in terms of implementing green oriented purpose and strategy with customers and other stakeholders.

Bourdieu and a holistic view of the change narrative

The above indicates that Bourdieu's (1986, 1990) theory and concepts provides a frame to develop an integrated interpretation of four parts of the green change narrative. Bourdieu's (1986, 1990) is used to explain *interactions* faced by financial firms, their decision agents, and stakeholders during strategic green change to 'head', 'house', 'community' and 'financial machine'. Such interactions arose within teams, financial firm hierarchy, and in external customer and stakeholder networks. Bourdieu analysis highlights that all four strategic green changes for 'head', 'house', 'community' and 'financial machine'; occur in *same time periods*, and in *mutual, reciprocal ways*. Bourdieu's theory integrates and connects these change narratives in one conceptual frame. It provides means to integrate empirical ideas about interactions between system elements, individuals, and teams during strategic green change and every-day operations.

Hence, the triad of field, habitus, and capitals, interact, change, and evolve together in fields. In these dynamics, individuals enter connected fields (of team, financial firm, external networks) with their capital and habitus based on upbringing and experience. To survive and prosper in these fields, they develop their habitus and capitals in each field in response to change such as climate change. In so doing they alter the fields through their new activities and capabilities. Thus, Bourdieu's (1986, 1990) concepts are used to explain interactions and dynamics during strategic change and everyday activities. In Bourdieu's terms, the green oriented interactions in the financial firm for 'head', 'house', 'community' and 'financial machine' are both structuring structures and structured structures in dynamic social fields.

The green oriented - *interactions between habitus, and capitals in financial firm fields, and practices - and – green oriented changes in field, habitus, capitals, and practices* - are both structuring structures and structured structures in dynamic social fields (Chen et al, 2018, p265).

They change together in mutual and reciprocal ways. *On the one hand,* the specialist habitus and capital of teams at all levels organises and affects individual and team practice and their perception of the social field and the way they use their capital and associated power. O*n the other hand,* the principles and expertise that top management, employees, and stakeholders apply are the product of purposeful interaction of the social fields and their habitus and capitals. For example, the adaptation of top teams ('Head'), the construction of green oriented socio technical infrastructure and control mechanism (fields) in the firm, and use of new interactions, all help construct working conditions and individual/team characteristics (habitus, capitals) for new green practice. Use of the latter during everyday interactions in the firm field maintains top team structure and socio-technical infrastructure and is the basis to learn how to adapt this over time. This reveals how the *multidimensional interactions* – both for strategic change and for everyday activities- are a critical *part* of the *larger mutual reciprocal dynamics* between field, and individual and group habitus and capitals. They connect - the influence of *context and mechanisms* - to the changes in 'lived experiences' and in habitus and capitals – *and their impact on* – practice, behaviour, and decisions- and *vice versa*.

4. A four-part change narrative – head, house, community, machine

The following subsections in section 4 includes further details of the four major parts of the integrated 'empirical change narrative'. Each part of the empirical change narrative is supported by a brief theoretical interpretation from specialist literature. These are intended to be viewed within the more holistic view from Systems, Cyert and March, and Bourdieu conceptual frames.

4.1 Changes in strategic thinking and top teams (the 'head') – as drivers of change in the firm

The first part of the strategic 'change narrative' explores how changes are driven by climate change. This involves top teams ('Head') 'looking out' to learn about external climate change. Top teams learn from other top teams and members of elites in the financial community about uncertainty and complexity induced by climate change and its physical risks and by associated regulatory changes (transition risks). As noted in section1 this involves collaborating in alliances within and across sectors to understand change and develop the 'rules of the game'. The activities involve top teams or the 'Head' 'looking in' and learning how to make changes in top teams in terms of composition and capabilities of boards and executive teams.

The theory and literature view of the ***first part of*** the strategic change narrative **begins** by viewing case financial firms as a 'learning organisations' (Pedler et al., 1997). Top teams 'look out' and learn about climate change (TCFD, 2017; CityWeek Day 1, 2021; Mizumo 2021, Net Zero Finance Conference, 2021). This is used to think about strategic choices (Buranatrakul et al, 2017) in financial firms - about new enabling infrastructure and enabling conditions with new sustainable advantages and resilient dynamic capabilities - in their firms as complex systems Learning by top teams is intended to lead to new knowledge, capabilities, and advantages in all teams, with top teams as major initiators of change. This is interpreted as top management in "Learning organisations" (Pedler et al., 1997) seeking knowledge to support new thinking to strategically allocate capital (financial, intangible, technology) to create an effective green organisation. This involves organisational change at the top (leadership, teams, governance, purpose) as well as organisational change throughout the firm and in its social networks (internal, external).

Looking out ' (Pedler et al., 1997) concerns top team learning, and reflexive thinking being stimulated by the wide public debate about 'green finance' and 'ethical finance' (Rose, 2020; Harrison, 2020). From Paris COP21 (2015) onwards, rapid change, active public debates, and specialist green finance and ethical finance conferences have accelerated bank internalisation of sustainability and CSR values. They have increased challenges to the dominance of shareholder wealth maximising values. They have increased the prominence of new green purpose in financial firms based on Net Zero aims. Much top team learning arises from membership of sector specific Net Zero alliances (bank, fund manager, insurance) such as GFANZ (2021). It arises from contributing to, and observing good practice and benchmarks for green finance, from bodies such as the UN, EU, PRB, PRI, financial regulators, and consultants (Holland, 2019). '**Looking out** ' (Pedler et al., 1997) thus concerns top teams in financial firms co-operating and learning together in peer group and sector specific green change alliances (GFANZ, 2021) or "communities of practice" (Lave and Wenger, 1991) This co-operative situation in 'finance society' also creates condition for 'heads' to agree that competition be conducted *within* such agreed frames for co-operative green change. These iterative and reflexive forms of learning illustrate the mutual reciprocal dynamics observed in cases such as NatWest and Schroders.

In Bourdieu's (1986, 1990) terms, the climate change debate has much influenced the fields, and agent and team habitus, capitals, and power of financial firms and external stakeholders. These external and internal fields are where top teams and stakeholders as climate change 'believers' are learning and developing a green orientation to their habitus and capitals and to top team power in these fields. They have high awareness and belief in climate change risks and have experience of growing social pressures to change. They use established private rituals (Boin et al., 2009) or practices for discussion and debate within peer groups alliances such as GFANZ to explore green change in financial firms and financial markets. These likeminded individuals working together in elite teams in firms, and in networks with powerful stakeholders, are developing group habitus and capitals in their shared fields, as an extra green dimension their individual habitus and capitals. The existence of such group "habitus" in top team "communities of practice" means elite financial firm and financial market agents are predisposed to structure relationships, networks and states of trust and confidence in elite tiers of 'finance society'. This creates enabling conditions for co-operative information flows, decisions and learning and knowledge creation between financial firm top teams and between them and other elite agents in financial markets.

Power is an essential resource when discussing green change in finance. Peer group alliances such as GFANZ have much power in promoting green change in finance. Bourdieu's (1990) ideas suggest that power in financial firms and their agents are likely to arise from their 'capitals' based on their size and control over resources. These include knowledge, information, financial capital, track record, reputation, and specialist skills. Combinations of such resources in alliances such as GFANZ determine relative bargaining power of these agents with regulators, government, and non-complying financial firms, in areas such as green practice guidance, and green taxonomies. They use their collective power based on shared capitals, to co-operate and bargain with other 'senior' or elite agents at industry, regulator, government levels in 'finance society'. Members of this external community explore and learn how to reduce the climate change impact of their collective actions (GFANZ, 2021), and how to achieve net Zero aims (eg see Green Finance events, London, 2017-2021). They co-operate and share power on many joint activities such as design of green products, choice of green taxonomies, and setting up new green finance markets.

The external fields are where financial firm top teams, other senior employees, and stakeholders, and other agents act, reproduce, and adapt their behaviours in both co-operative and competitive ways. They use their human, relational and reputational "capitals" and the combined power derived from them, for co-operative purposes. Within this context, top teams and their firms continue to compete for information and economic advantage through firm specific power derived from unique "capitals" of their teams and individuals. Thus, under pressure from Paris COP21 (2015) aims,

TCFD (2017), alliances such as GFANZ (2021), and Glasgow COP26 (2021), many organisational wide factors in co-operating financial firms are changing together in the cases over periods of two to five years. The changes are aligned in the same green direction. They all are expected to affect the climate change resilience of individual firms, and of co-operating firms as they change.

Changes in the Head by the Head

The changes in boards and teams for climate change reasons reflect many change pressures post 2008. Historic cases of **failure and error** such as RBS/NatWest during GFC and Wells Fargo in 2010-2016 show factors required in financial firms to speed up learning and change. These include raising top team understanding of risk and uncertainty, ensuring the quality and honesty of top teams, and demanding authenticity and credibility in their behaviour and communication in the firm and to external stakeholders. Strong corporate governance and stakeholder accountability mechanisms are critical to ensure the latter. Pathan (2009) showed how, in financially oriented US banks, CEO power to control board decisions, negatively affected bank risk-taking. This was evident in the GFC when CEOs in banks exhibited such power and led the banks to failure. This power is being counterbalanced in new boards that develop a consensus view on how to manage climate change risks. Case firms such as NatWest and Schroders and members of specialist financial sector (Net Zero) alliances (GFANZ, 2021) are learning about the nature of climate change risks. They are learning how to make changes to the 'Head' in terms of leadership, and composition, diversity and governance of board and executive teams, to create the capabilities to deal with climate change risks. They are changing firm purpose, function, planning and reporting.

The green oriented top teams or 'Heads' are enhanced means to make strategic choices about the green purpose and orientation of the firm, and to performance metrics about Net Zero outcomes. Given TCFD (2017) pressures, such diverse boards are likely to improve the quality of climate change reporting and wider CSR reporting. This reflects findings by Birindelli et al, (2018, 2019); Jizi et al (2013); and Kilic et al (2015). For example, gender and knowledge diversity of leaders and in boards of bank is associated with environmental performance (Birindelli et al, 2018, 2019; Deloitte, 2020). Jizi et al (2013) found evidence that US bank board independence and board size, the two board governance characteristics 'usually associated with the protection of shareholder interests, are positively related to CSR disclosures'. CSR disclosure included environmental concerns such as implemented systems for environmental management, projects for recycling and protection of natural resources, and energy saving in performing business. Kilic et al (2015) also found that CSR reporting of banks improved during 2008 to 2112, and this was associated with size, ownership diffusion, board composition and board diversity.

However, a cautionary note is required here. Despite the above significant changes in learning, thinking and organisational change by top teams leading firms, it can be argued that learning behaviour and strategic choice of top teams and employees is still not changing at the rate required to meet key staging points in 2025 and 2030 and hence avoid 'tipping-points' and meet 2050 climate change outcomes. The problems observed in the GFC (Holland, 2010), and those faced by Wells Fargo with its CSR policies in 2010-2016, indicate that top team and employee learning can continue to be problematic with climate change, leading to adverse outcomes for firms and wider society. For top teams that continue to be steeped in the traditional culture of finance and its restraining social forces (Lewin, 1947), there is still a tendency for learning to focus on how to organise the firm and conduct its activities to primarily stabilise external financial states within change. There is still a propensity for 'deniers' to avoid what they consider to be negative consequences for power, reputation and financial benefits of top management. There is still an inclination for learning to be dominated by concerns about positive financial outcomes for shareholders (Holland, 2017). As noted above, climate change concerns of stakeholders are increasingly counterbalancing this by supporting top team climate change believers operating in finance sector alliances (GFANZ, 2021). However, these may remain a lower priority amongst climate

change sceptics and deniers until a major climate change crisis occurs. The Covid-19 crisis in 2020-21 has provided further change momentum and challenged deniers in this respect.

4.2 Changing context as adapted infrastructure and mechanisms - adapting existing 'house' and 'community'

The second part of the strategic empirical 'change narrative' explains how the green oriented ***changes*** in top teams lead to changes in their learning, understanding, and strategic thinking capabilities. They use these to 'look in' and learn how to adapt key parts of their internal non-financial context. They are the basis to make green oriented strategic changes to purpose. and planning. They create the capability to develop strategic plans (1,5,10, 30-year horizons), targets and metrics, and to make strategic change throughout the firm ('House') to match external conditions and needs. This involves green oriented strategic changes to the ''enabling infrastructure' or 'soft' 'socio-technical' contexts (Mumford, 2000; Mitleton-Kelly, 2003) in the existing financial firm 'house' and 'community'. These are the non-financial factors influencing the use of financial resources.

The socio-technical infrastructure ('House') is further broken down *in the cases* into three clusters of strategic change. The first cluster includes changes to firm wide social and knowledge resources at both macro and micro levels. The second concerns green changes to control and influence mechanisms (culture, incentives etc). The third cluster involves green changes to technology. These changes are strategically matched to changes in the external environment (Teece et al., 1997) concerning climate change and the need to develop resilience in the face of uncertainty.

This section uses empirical sources in financial firms to identify a wide idea of strategic variables and their changes. These go beyond studies such as Buranatrakul et al (2017) and Raut et al (2017). Burunatrakul et al (2017) identified five variables in the literature, including bank management commitment, emissions reduction, product development, organizational involvement, and external relationship development. Raut et al's (2017) variables from literature and bank Balanced Score cards included financial stability, customer relationship management, internal business process, and environment-friendly management system. In this paper, these variables are recognised as part of larger strategic adaption in the financial firm cases.

These firm wide green strategic changes are intended to support a shift to green financial practices. This involves greening of the internal physical operations, offices, and use of transport systems by the firm. It involves allocation of financial capital from heavy carbon use into green uses in the economy.

The new external social field 'atmosphere' for combined co-operation and competition: between top teams; and between them and regulators, national governments, international agencies, and CSOs; is especially relevant for stimulating 'Looking in ' learning (Pedler et al., 1997). This concerns top team and employees shared learning, and reflexive thinking about structural change and behavioural change *within firm* and customer networks.

The change pressures, and change in purpose and green orientation, are means for top teams ('head') to learn and adapt the socio technical infrastructure ('house') and 'community' fields, and to mobilise control mechanisms in a *top-down way*. These are the basis to influence working conditions. and influence every-day behaviour and financial decisions by individuals and teams in the wider community of the firm.

Learning by 'looking in' also occurs in the case financial firms during everyday actions (learning "by doing" and "by trial and error"), by imitation and during periods of reflection and discussion (reflexivity) (Pedler et al., 1997). Learning occurs through knowledge transfer mechanisms such as recruiting experienced managers, and attending green finance, net zero, and ethical finance conferences.

'Looking in' (Pedler et al., 1997) thus concerns learning and adaptation by top teams and other teams. This creates means to think about creating resilience and dynamic capabilities in contextual resources, interactions, conditions, and decisions. The many interacting aspects of complex systems in firms and external networks, and their dynamics are the focus of change. They form the core of complex change dynamics outlined in the cases. **In more specific terms,** the change narrative starts with change pressures and learning at board and executive team levels. Case firms recognise the need to develop their long term and short term strategic thinking and planning in climate change (Mirfenderesk, and Corkill, 2009), and to make contributions to reductions in GHG consistent with Paris 2015. The firms are making plans for one year ahead, five-year, ten year, and 30 year horizons consistent with; Paris, (2015), TCFD (2017) demands (Haas, Minaar, Tuffley, Net Zero Finance Conference, 2021), and with membership of Net Zero alliances (GFANZ, 2021). They are thinking how to make strategic choices to develop resilient financial firms capable of managing the new risks, and to continue to deliver their core financial functions and performance in the economy.

Thus, Top teams learn and think how to make strategic choices about new enabling infrastructure and enabling conditions with new sustainable advantages and resilient dynamic capabilities in their firms as complex systems (Fiksel, 2003; Souza et al 2017). Top teams and other employees and their teams are using these learning opportunities and experiences to develop shared dynamic capabilities (Teece, 2007) in knowledge intensive and green oriented social infrastructure (intangibles) and technology (tangibles). The latter formed intellectual capital (Meritum, 2002) in the firm, in teams and individuals. They explore how they use these changes to shape the **broad tendency** of green oriented behaviour and action of individuals and teams throughout the firm. They change their views of nonfinancial resources as the prerequisite to change use of 'hard' financial resources and achieve hard performance targets, both financial and sustainable. This reflects Ortiz-de-Mandojana et al (2016) argument and evidence that, *'firms that adopt responsible social and environmental practices, relative to a carefully matched control group, have lower financial volatility, higher sales growth, and higher chances of survival over a 15-year period'*.

In the cases these choices and decisions are made over periods of three to six years with Paris COP21 (2015) and Glasgow COP26 (2021) being major stimuli. The changes occur in the same periods, are aligned, and mutually reciprocal in nature, with each top team factor change impinging on changes in other areas and the whole firm system. The above changes in top teams or about the 'Head' lead to strategic choices about the 'House'. They drive co-ordinated changes to contexts, mechanisms, and technology - throughout the financial firm, its teams, and individuals - to achieve sustainability and financial aims.

The cases illustrate that learning about climate change leads to **three major clusters** of strategic organisational change to firm socio-technical infrastructure and context. The first cluster includes changes to: firm wide social structure, culture as 'organising' means, and to knowledge resources; at both macro and micro levels. The second cluster concerns green changes to control and influence mechanisms. These include communications and storytelling, top team behaviour, training, incentives ('soft atmosphere' and 'hard' financial), and control systems, as well as changes in culture as a means of controlling and influencing. 'Culture' is a term frequently used in cases to connect ideas of social organising and social means of control and influence. Change involves both dimensions of culture together. The third cluster involves green changes to technology and its impact on the other changes.

The *theoretical analysis* of the ***second part*** *of the* 'change narrative'

This discusses how the case firms use their top team learning and planning capability to promote green organisational change in the socio-technical infrastructure in the three clusters throughout the firm, and to 'people' in its teams and individuals .

In Bourdieu's (1986, 1990) terms the above greening of the 'house' of infrastructure, mechanisms, and technology reflect 'people' activities arising from changes to employee 'habitus', 'capitals', and power in internal 'fields'. Top teams use their capitals and power (as '*symbolic violence*') to influence practice in firm and customer networks. They use the strategic green changes (in the 'house') to promote 'top down' green changes in internal fields and influence green adaptation of habitus and capitals by employees throughout the firm, and with less powerful external stakeholders such as customers. They promote employee learning (and 'illusio') on how to 'play by the rules' in finance and the economy arising from climate change. They invest in these new green rules in a top-down constructed system or social fields.

A range of interdisciplinary literature and theory source provide focussed means to further develop the analysis of the ***second part*** *of the* 'change narrative'. O*rganisational* literature and theory sources such as: Stensaker et al, (2008); Burnes, (2004); Mile & Snow, (1978); Child, 1972); Cyert and March, (1963); Lewin, (1947); provide insight into how such learning and green changes in organisational, and team **contextual** settings in firms, are the basis to change and shape behaviour and actions. In the strategic choice and organisational change literature (Child, 1972; Mile & Snow, 1978), top teams in financial firms develop their strategic responses to climate change to adjust the firm strategic position, organisation, operational capabilities, and behaviour, to survive in new market and socio-political, and climate circumstances. Mile et al (1978) argue that examining organizational adaptation is difficult, since the process is highly complex and changeable. They propose a change framework for firms to develop strategy and construct mechanisms (structures and processes) to pursue strategy based on industry studies and literature. This is adopted in this paper.

The strategic change process requires change in team, firm, and stakeholder social fields, with these in continuous state of adaptation (Lewin, 1947). Behaviours and decision actions in these social groups are influenced by a dynamic balance of restraining and driving forces. In Bourdieu's (1990) terms this involves change in habitus, capitals, and behaviour of individual and teams in the firm. Schein's (2004) ideas of culture as an important learnt and evolved property of organisation life, plays a role in explaining behaviour and change.

From a *system theory* perspective, the firms develop a green orientation to their 'Socio-cultural and technical' elements (Mitleton-Kelly (2003) or soft', technology, and measurement parts of the firm complex system (Saltmarshe, 2018)**.** They create green dimensions to intangible factors such as social structures, culture, and knowledge and how they operate at organisational, team, and individual levels. They make green changes to 'hard' tangibles such as technology and buildings, and closely integrate these with green changes in 'soft' elements of the financial firms to form a new socio-technical infrastructure (Mitleton-Kelly, 2003). They develop green changes to corporate purpose and pursuit of 'hard' performance targets and metrics, both financial and sustainable.

Green knowledge resources concern knowledge of climate change risks, social organisation, green finance, and design of new green products. They formed intellectual capital (Meritum, 2002) and comprised three elements: human, structural, and relational capital (Mouritsen et al., 2002). These green knowledge factors influence behaviour and decisions. Their impact on tangibles (especially financial intermediation mechanisms and financial resources) are the primary source of sustainable competitive advantage in business models (IIRC, 2011) in the case financial firms (Holland (2010); Chen et al (2014).

The green oriented influence and control mechanisms, such as culture, formal controls, and incentives, formed additional ways of organising and integrating firms and enabling behaviour and actions (Moon et al, 2011; Gond et al, 2012; Beusch et al, 2016). Financial firms develop and exploit these different but complementary ways of 'organising' in financial firms involving social organisation (social integration), shared capabilities (technical integration), and ways of thinking (cognitive integration). Their combined and connected presence support working

conditions or enabling conditions (Mitleton-Kelly (2003), to 'allow' behaviour and enable green information production and financial decisions.

New technology was a key factor in creating new socio-technical systems and conditions (Mumford, 2000). The Covid-19 experience showed how it did this by disrupting ways of conducting established activities; changing structure of organisations, nature of work and working patterns in the firm and teams; and altering power conditions within the firm and externally with customers in market social networks. These changes to the socio-technical infrastructure create economic advantages in behaviour and information production. They lead to green changes in transforming risk, return and liquidity of financial resources (financial intermediation) (Buckle, et al 2011; Holland, 2019b)and in delivery of financial services. Thus, all non-financial and financial parts of this complex system are the focus of strategic green change. The above analysis explains how the full set of integrated and green oriented socio-technical infrastructure and knowledge factors embed green change (Lueg & Radlach, 2016) in financial firms. These integrated social and knowledge factors, influence and control mechanisms, and technology, are means to prevent the dominance of financial values and avoid the 'tragedy of the horizon' (Carney, 2015).

They are means for financial firms to create incentives for their employees at all levels, and their customers to place a value on the climate and nature and to act to protect these (Dasgupta, 2021). They are ways to green the habitus, and capitals of employees. They are systematic and connected means for financial firms to control 'crowding out' pro-social behaviour (Bénabou, Tirole, 2006) at a time when a new perspective is required. They are means to promote 'sustainability orientation' and environmental pro-activity (Ditillo & Lia, 2016) in financial firms, their employees, and customers. For example, the combination of environmental consciousness from green oriented 'soft' context and mechanisms, and links to 'hard' financial incentives such as pay, are critical to changing habitus, capitals, and behaviour of managers and employees to ensure they pursue sustainability aims (Narayanan et al, 2021) in their financial decisions.

4.3 **Using 'people' interactions in 'community' –to mobilise mechanism within context – influence conditions**

The third part of the strategic empirical 'change narrative' concerns core dynamics in the change process involving many interactions and 'lived experiences' by individuals and teams 'living' in increasingly green oriented 'communities' in the firm and network system or field. The external 'atmosphere' for co-operation and competition: and green oriented structural change *within the firm* social setting, are system wide influences on these internal interactions, 'lived experiences', and behaviour change by individuals and teams. They are means for top teams to influence working conditions for employees at all levels. This in turn is expected to improve individual and team performance, customer relations, and firm performance. In this regard, Esteban-Sanchez et al (2017) found that during and after the financial crisis (2005-2010) banks with better employee relations and corporate governance had better corporate financial performance. During the crisis, better relations between employees and the community were valued positively by investors, which, in turn, increases corporate financial performance.

The *theoretical analysis* of the ***third part*** of the strategic change narrative uses a range of literature such as Mumford (2000), Bourdieu (1986), Stones (2005), Schein (1989), Weick, (1995), Boyce, (1996), Statman, (1999) and Cyert and March (1963). These interdisciplinary resources are used to interpret the above mutual reciprocal interactions and co-evolution (Mitleton-Kelly, 2003) in the dynamic system at both **system** and **individual** levels.

A system level view of interactions.

From the system level perspective, Top teams and other employees in case financial firms *use* ***purpose*** *led* **mechanisms** (for control and influence) within **infrastructure,** to drive *multi-dimensional social* ***interactions*** (top down, bottom up, lateral, and network) *by 'people'* in the firm and network 'community'.

The interactions or **organisation processes** (Cyert and March, 1963) are used to exploit green changes at the top and to **socio-technical infrastructure** and its social and knowledge resources. They argue that clearly structured organisational processes are means for uncertainty avoidance and conflict resolution in the firm. The financial firm-wide organisational processes and context-based resources are integrated means to cope with and reduce the uncertainty associated with green oriented financial decisions at transaction and portfolio levels (Hellman 2000). Firm specific strengths in green oriented socio-technical infrastructure, as well as in team and individual characteristics, are expected to play a role in uncertainty avoidance and conflict resolution in the team-based and goal-seeking task sequences or financial decision routines (Cyert and March 1963) of top team, middle management, and front-line teams. They are also the joint base from which creativity could be stimulated in individuals and teams.

Thus, in case firms, the *purpose led* context, mechanisms, and interactions are collectively used to change and shape **working conditions** and advantages for teams and individuals at all levels in the firm system. The green oriented working conditions are intended to influence the 'community' and 'lived experience' of individuals, teams, in the firm, and externally, **to go green** to achieve aims. They are used to embed green purpose in all aspects of firm life and activities. In the firm system, they are basis to shape green oriented changes in **everyday** behaviour and actions of individuals and teams. They influence interpretation of external events and stimuli, and guide behaviour and decision actions.

From a system theory perspective (Mumford, 2000; Mitleton-Kelly, 2003) the *multidimensional interactions* are a critical *part* of the *larger mutual reciprocal dynamics* between context, mechanisms, and conditions in the complex system. At the system level, they connect - the influence of *context and mechanisms* - to the changes in *working conditions, advantages, behaviour, and decisions*- and *vice versa*. Managing the system wide, mutual, reciprocal dynamics, in positive self-reinforcing cycles, is the basis to achieve sustainability (Net zero) and financial aims. These form the core of complex dynamics outlined in the cases.

Thus, new green purpose, socio-technical structure, and organisational process *shape* changes in decision behaviour in teams and individuals at all levels. Purpose led mechanisms (for control and influence) and purpose led 'people' interactions (multidimensional) *influence* the financial firm 'community'. They create momentum for driving financial decision actions within the 'house' and external networks. Collectively, they influence 'ongoing engagement' with employees, customers, and stakeholders about change, as well as about delivery of green products.

Individual and team level perspective on interactions in fields.

From the perspective of individuals and teams *operating in the system or field*, **purposeful interactions** arise at individual, team, firm, and network levels. The interactions concern top-down processes such as setting a green 'tone from the top', and promoting green oriented culture (Schein, 1989). They involve individuals and teams (and their social and knowledge characteristics) interacting with each other in multidimensional ways (through bottom up, lateral, and network collaborations), within green oriented organisational structure and network contexts.

In the cases, the influence of these factors, and the balance chosen between top-down direction and autonomy allowed within the firm, determines the nature, scale, quality, and 'atmosphere' of interactions and working conditions. The multidimensional social interactions are the primary means for teams (top, all levels) to mobilise - the socio technical infrastructure and firm wide controlling and influencing mechanisms - to create desirable or green oriented working conditions, and influence behaviour and financial decisions of individuals and teams.

The financial firm team context is thus key to working conditions, behaviour, and decisions. In part, the team context reflects combinations of the personal contexts of individuals and their individual knowledge, skills, experience as in

Bourdieu's (1990) ideas of in Habitus, and Capitals. They also include psychological tendencies such as overconfidence, confirmation bias, and framing from Behavioural Finance (Statman, 1999). They also involve the unique context and properties formed by the team and group processes such as trust and confidence, based on collective individual characteristics (Gratton, 2002).

The working conditions at the level of individuals and teams include emotional enabling conditions such as trust, desire to co-operate, sense of ease of communications, shared sense of purpose, and buy-in to the change narrative (Holland, 2016). They include desirable decision and working conditions based on; understanding of climate change risk, ability to create green information about fund users and suppliers, and to control their own behaviour relative to sustainability and financial aims.

The change to working conditions are made to improve individual and team focus on risk and opportunities relative to Net Zero (GFANZ, 2021) and financial aims. They are used to change behaviour and create information for financial decisions. Multidimensional social interactions by employees (top down, bottom up, lateral, network) within new green socio-technical infrastructure, are used to mobilise influence and control mechanisms such as culture, and incentives. They exploit change in these social and knowledge structures and mechanisms, and shape and drive new behaviours. The changes and interactions by individuals and teams in system or field contexts influence green oriented interpretation of external events and stimuli, to guide behaviour and decision action. These mutual reciprocal interactions during everyday activities play a role sustaining social and knowledge structures (Bourdieu, 1986; Stones, 2005), and in stimulating further change and evolution over time.

From Bourdieu's (1986, 1990) perspective, concepts of 'fields', 'habitus', 'capitals', and power provide insights to the 'people' dimensions to the above multidimensional interactions and how they relate to resource mobilisation and interactions. As noted above the top down, strategic green changes and development of green oriented social settings, mechanisms, in the wider firm field create green working conditions for individuals and teams below top team levels. These conditions are the basis for employees to make choices on how to adapt their 'local' team fields, 'habitus' and 'capitals' to be green oriented. This includes individuals and teams at middle management, back office, and front-line levels, and in external networks. They are means for individuals and teams to adapt their 'habitus' and 'capitals' in their 'local' field or community in green oriented interactions (in 'bottom up', lateral, and network ways) to reflect green issues. To survive and prosper in these fields (team, firm, network), they develop their habitus and capitals in each field. Bourdieu refers to 'illusio' whereby individuals and teams in fields 'play by the rules' and invest in these new green rules in a top-down constructed system or social fields. In so doing they alter the fields through their new activities and capabilities. For example, active learning by employees (middle management, back and front office) during the top-down strategic change process in the firm, contributes to how they construct their everyday understanding of, and 'comfort' with their social world or 'fields' as "**habitus**" (Bourdieu, 1986). Employees learn from top team behaviour and policy statements, as well as from training, and climate change analyses. Learning contributes to the way they adapt prior knowledge, construct their technical capital and skills, and social capital (say reputation), within the firm and in external networks.

Habitus and capitals of individuals and teams (at all levels) in the financial firm field, are major influences on every-day behaviour when performing their specialist financial tasks. The green oriented capitals and habitus are used by individuals and teams as sources of capabilities and power, to mediate the impact of climate change pressures and changing ideas of shareholder wealth aims on their behaviour and financial decisions. This involves behaviour change and new actions in new green oriented fields such as financial firm organisation, teams, market network, and wider stakeholder networks

Additional theory perspectives

The theory analysis of the third part of the strategic change narrative is further developed using interdisciplinary sources such as Schein (1989), Weick, (1995), Boyce, (1996), Statman, (1999). **These theory sources** are used to interpret how the mobilisation of combined influence and control mechanisms such as culture, communications, and storytelling, are at the heart of change dynamics. For instance, **cultural** norms and firm story are critical contextual means in financial firm cases (Harrison, 2020; Rose, 2020). They are used by **top teams to influence** employee thinking and behaviour and drive behaviour towards sustainability aims. In Bourdieu's terms they influence individual and group habitus and capitals.

Schein (1989) notes that culture concerns norms of behaviour and beliefs. It is an important learnt and evolved property of organisation life which plays a major role in influencing action and behaviour. It is a '*pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration'.* Culture can be interpreted as part of the historic story shared in the firm and amongst stakeholders, about acceptable and required beliefs and behaviour in a financial firm. In Bourdieu's terms it can be interpreted as a firm wide dimension to habitus and capitals of individuals and teams. For example, Harrison (2019) notes how employees use their *multi-dimensional* interactions to exploit green adaptions to culture and to a green change narrative, to change working conditions and behaviour. Harrison (2019) uses narrative to promote Schroders's culture and highlight the importance of employees to change processes. He makes a case to employees and stakeholders that 'Getting people right and getting culture right… then business decisions were relatively straightforward'. He explains how Schroders invested (money, time, effort) extensively in culture and 'people' factors to create the 'right' conditions at work.

At the level of teams and individuals in firms such as Schroders and NatWest, the firm specific change narrative; is interpreted as key means to communicate, *sense,* and comprehend change such as climate change. It is a means to develop a firm wide dimension to habitus and capitals of individuals and teams. This narrative is communicated in the context of adapted social infrastructure and knowledge resources, and by use of influence and control mechanisms such as culture, formal controls, and incentives. Narrative, set in context (system or field), is used by employees *to sense* and interpret major external events and ongoing stimuli (Weick, 1995). The story of change is designed to enhance 'collective mindfulness' and reduce 'the perceived level of equivocality' in the habitus of individuals and teams. It is a basis to develop individual and team capitals. It forms a well understood and accepted basis to behave and take desired actions (Weick, 1995). This reflects how top teams in financial firms recognise the central role of credible, honest, and clear communications about the impact of climate change on the firm.

Boyce, (1996), argued that such storytelling is used as a vehicle for "collective centering and collective sense making" within organisations. It is a means to co-ordinate interactions and behaviour of many individuals and teams. Communication takes the form of clear and consistent storytelling (Boyce,1996) to employees about the change process and its purpose, engagement with employees, and importance of cultural norms. For example, in the financial firm cases the story is inter alia, about; green purpose, targets and metrics, function, context, conditions, process, and outcomes; in both operational and change narratives. Narrative is used to explain to employees and stakeholders, the role of green oriented enabling infrastructure and conditions, and major processes and events on financial firms and their business models (IIRC, 2013). It seeks to explain their impact on customers and clients, and how customer and corporate actions create financial outcomes (cost, income, and value) and Net Zero sustainable consequences. Care must be taken with these ideas because cases such as RBS (now NatWest) and Wells Fargo have shown that management can exploit storytelling in their interests and disguise the continued dominance of financial aims over Net Zero aims.

4.4 Changing economic conditions and financial decisions in a financial 'machine'

The *fourth part* of the strategic empirical 'change narrative' highlights how changes to the non-financial context and working conditions in parts 1 to 3 of the change narrative, supports new economic conditions and ways to deliver new financial decision activities and products that reduce greenhouse gas emissions. The decisions concern creation of new green oriented financial assets and liabilities (and derivatives of) in firm's specialist domain.

The narrative explains how changes in context and process lead to changes in 'ongoing financial decisions' at single transaction, portfolio, and firm levels. It illustrates how the financial firm **mobilises** the chosen intangible and technology resources to manage risk, respond to uncertainty, and deliver its specialist financial functions, financial assets, and liabilities, to customers in markets. It does this to make a profit and achieve sustainability aims**.** It is a basis to explain how changes in the above lead to desirable changes in outcomes, as well as in consequences and feedback.

The strategic change narrative clarifies the multiple drivers of behaviour and action in decisions by teams at all levels in case financial firms. Top-down changes in context (structure, process, purpose), measurement, and active communication together with employee interpretation of external stimuli are the primary drivers of behaviour and decision actions (Hellman, 2000, Holland, 2016). These are a central focus of green oriented change. The contextual, interpretative, and 'measurement' changes are expected to influence changes in green financial product design and delivery, and to change customer and stakeholder engagement activities.

More specifically, the new working conditions improve each decision team's focus on financial risk and opportunities relative to Net zero and financial aims. They change the way financial resources are used in operational activities and financial decisions. They change financial decisions to save, lend, invest, or insure to reduce harm (of GHG emissions) and increase the chances of Net Zero sustainability outcomes. They change financial decisions to create and use derivatives of these underlying transactions to manage new green risks. They provide means to deliver green financial services and functions required by customers, employees, shareholders, citizens, and other stakeholders in their pursuit of Net Zero outcomes.

The *theoretical analysis* of the *fourth part* of the strategic change narrative makes *specific* use of theory of the firm (Barney, 1991; Hart, 1995; Teece, 2007, 2016) and theory of finance (financial intermediation) (Scholtens and van Wensveen, 2003; Holland, 2019b). The literature analysis explores how financial firms changed to both co-operate and compete. These literature sources are used to explore how strategic changes to non-financial context and working conditions, change economic advantages for financial firms, and create means for green oriented financial activities and decisions. This analyses how change to the non-financial context - influence and support financial decisions, the delivery of green financial products, and transformation of financial resources, consistent with complementary sustainability and financial aims. This shows how conventional theory of the firm and of finance can be used together in co-operative and competitive circumstances.

The existential threat of climate change and regulatory pressures means that top teams seek to create co-operative advantages with their sector peers in other financial firms (GFANZ, 2021) and with client firms in the real economy. In this co-operative context they pursue sustainable co-operative and competitive advantages (SCCA) to create superior financial performance that supports shared climate change aims. This demonstrates that **the resource-based view of the firm** (Barney, 1991; Hart, 1995; Teece, 2007, 2016) can reflect both co-operation and competition. It shows the relevance of this theory viewpoint to developing a change narrative and using it to stimulate thinking and action concerning the unique circumstances of climate change. Shen et al (2016) find that CSR banks overwhelmingly outperform non-CSR banks in terms of return on assets and return on equity. This suggests that those banks that

collaborate on common CSR frame and policies for action, especially the climate change component of CSR and its social and economic impact, are more likely to create additional financial value than those who do not collaborate.

Literature from the 'Behavioural finance' perspective (Statman, 1999) indicates that the case financial firms seek to use their new green context, process, and capabilities to reduce behavioural biases (say optimism, confirmation) in firm employees and their teams when making decisions with customers in markets. These biases can subvert and undermine behaviour (Holland, 2016) consistent with Net Zero aims, and financial value aims. Given climate change threats, they exercise control over their tendencies to exploit behavioural biases in others that lead to increased GHG emissions.

In Bourdieu's (1986, 1990) terms the green strategic changes are means for individuals in middle management, back office, and front-line teams, to adjust to changes in their external internal and external fields and working conditions, to adapt their habitus, capitals, and power in these fields. For example, likeminded individuals working together in specialist front-line teams with unique customer segments, are developing group habitus and capitals in their shared fields, as an extra dimension their individual habitus and capitals. They co-operate and share power on many joint activities such as; engagement within and between teams, and engagement with customers and external stakeholders; on how to develop green orientation to their shared information exchange and transacting activities, consistent with Net Zero aims. Individual and front-line teams in green oriented financial firms can then also use their unique habitus and capitals to compete with those in other financial firms to maintain the customer base, secure the new green business, and create financial value from this, all within co-operative aims for Net Zero.

Front line teams use their capitals and power (as '*symbolic violence*') to engage with customers and influence green oriented practice with customers in markets and networks. Power in front line agents arises from their 'capitals' based on their size and control over resources such as information, financial capital, reputation, and specialist skills in green finance. These determine relative bargaining power of these agents with 'relationship' customers in persuading them to exit from high carbon activities and replace them with Net Zero compliant economic activities. Front line agents invest in active engagement with customers to promote customer learning on the new green rules of the game in finance and economy arising from climate change. Customer also adapt their 'habitus' and 'capitals' in fields with 'relationship' financial firms to reflect green issues. Bourdieu refers to 'illusio' whereby customers in these social fields 'play by the rules' and invest in these new green rules. In so doing they alter the fields through their new activities and capabilities.

These changes have major implications for issues of enhancing information production and reducing information asymmetries on green finance issues between financial firm front line agents and customers. From a finance **theory** perspective (especially financial intermediation) these lie the heart of successful green financial transacting and green financial intermediation by financial firms (Scholtens and van Wensveen, 2003).

As a result, finance **theory** is an important means to interpret how changes to; 'soft' or non-financial infrastructure, co-operative behaviour, and competitive advantages; are the means reduce major information asymmetries (Holland, 2019b). Finance theory, despite its problems (Turner, 2009, Gendron et al, 2013) is still the best way to explain the use of financial resources in financial institutions. It is the only way at present to explain financial risk management and financial intermediation. This theoretical idea of 'financial risk machine' shows how financial capital *(actual, promised, and derivatives of)* is transformed (size, risk, maturity, liquidity etc) to satisfy the needs of customers.

This function must be done correctly irrespective of whether the financial firm pursues shareholder wealth, or wider society benefits by pursuing sustainability aims, or both. The key questions are who controls this financial transformation process? – and who benefits from it? Shareholders, wider society, life on the planet, or all of these? This paper provides a means to think how to widen control of use of finance resources for Net Zero purposes.

Holland (2019b) has shown that finance theory, and an interdisciplinary approach are compatible when combined in finance oriented BTFF, are compatible. The same approach is adopted here with a green oriented BTFF. Green oriented organisational means and competitive advantages are the means to use resources to overcome major behavioural and informational problems, to deliver innovative green financial services for net zero outcomes as the priority, and to then use this to generate superior financial performance. More specifically, the changes to co-operative behaviour between financial firms on matters: such as green taxonomies, broad structure of decision practice, and design of products; are means to reduce major information asymmetries and transaction costs associated with climate change risks, between financial firms, and between them and their customers. The changes to 'soft' or non-financial infrastructure, and development of firm specific competitive advantages within the agreed co-operative frames, are means to reduce information asymmetries and transaction costs between financial firms and their customers.

Both processes support interpretation of stimuli, events, customer demand, market changes. They reduce problems of information asymmetry, moral hazard, adverse selection in the firm, between firm and customers, and with other stakeholders (Hefferman, 2005). This creates opportunities to source and allocate green funds and make green oriented changes to the provision of 'hard' financial products and financial functions. These changes make green transacting possible and improve the chances of success in financial transactions. This in turn improves the chances of success in green oriented financial intermediation and in the management of green financial risks in the whole financial firm (Scholtens and van Wensveen, 2003). Hence the core function of the financial firm is sustained in the new green world.

The above analysis connects theoretical ideas of organisational learning, structural change, behavioural change by individuals and teams, and dynamic capabilities, to ideas of financial intermediation and financial decision making. It demonstrates how an interdisciplinary approach can be used to understand the complex financial firm system and its use of financial resources. This shows how finance theory can reflect both co-operation and competition, and how it can be related to other disciplines. This shows how problems of using single theories alone (say finance theory) can be overcome. It shows how each theory can become more relevant by making clear conceptual connections to other theory viewpoints which all address a common empirical phenomenon (Holland, 2019).

5. Discussion

This paper has used empirical research combined with interdisciplinary analysis (Knights and Willmott, 1997; de Bakker et al, 2019) to understand green oriented change in the complex system formed by a financial firm and its networks. Sections 3 and 4 show how the explanatory power of empirical narrative is enhanced by interpretation in an interdisciplinary theory approach (Knights and Willmott, 1997; de Bakker et al, 2019). Empirical narratives and theory narratives (Golden-Biddle and Locke, 2007) formed a conceptual framework or a Green 'Behavioural theory of the financial firm' (green BTTF). This is an alternative and complementary means to understand multi-faceted aspects of change in the complex system. This knowledge strategy is a basis to close major knowledge gaps in fields of practice in individual firms and the wider community. It is a means to close knowledge gaps in academe amongst finance and non-finance researchers. It is used to explore how to 'make a difference' in thinking and actions by practitioners and academics so that financial firms can go green

5.1 A knowledge strategy

The green BTTF directly addresses issues of uncertainty and complexity. This approach is an embryonic attempt to counter problems of partial explanatory narratives, narrowly focused and misplaced research, fragmented thinking, and uncoordinated action, in these complex systems. The green BTFF forms a key part of a knowledge risk management strategy (Zack, 1999, La Torre. 2020) which directly addresses uncertainty and complexity by closing, in part, the **knowledge gap** (Holland, 2010) for academics *and* practitioners. This is the gap between what

academics *and* practitioners - know about the greening of financial firms - and what they need to know - when researching and making decisions during rapid change with potential for severe crisis (Bratianu, 2020).. This is a basis to develop integrated thinking and promote holistic change in theory building, academic research, and practitioner actions. This knowledge strategy goes beyond conventional knowledge risks concerning financial intermediation, and regulation of financial risks (Holland, 2010); to risks with knowledge of non-financial aspects of firms when supporting financial activities. It is a means to close the new 'green' knowledge gaps in fields of practice (firm, community) and academe, in a complementary and integrated way. The paper seeks to contribute to finance community attempts to close practice knowledge gaps by developing an empirical narrative of change in financial firms. It seeks to use interdisciplinary theory analysis of the empirical narrative to close the knowledge gap in the field of academic research and hence promote academic research on the greening of finance. It aims to use the academic conceptual frame as a Green BTFF to further close the knowledge gap in the field of practice.

This knowledge of the green financial firm and its change narrative is the basis to convey the essence of the complex system and its change process without being overburdened by complexity of the phenomena being researched. It is a way for blindfolded observers to see the invisible 'elephant' (Saxe, 1872) and to use this to make green changes in its direction and activities. It provides means for academics *and* practitioners to think how to actively manage mutual, reciprocal dynamics in financial firms, in positive self-reinforcing cycles, to achieve net zero and financial aims. The holistic view provides means to develop research, integrated thinking, influence behaviour and drive co-ordinated green oriented actions. The green BTTF has many potential uses 'to make a difference' in learning, thinking, discussions, and actions by individual financial firms and by co-operating and competing agents in the finance system and wider society.

5.2 Making a 'difference' through integrated thinking and actions – by practitioners in financial firms.

The evidence about climate change indicates the potential for the 'tragedies of the horizons and commons' remains high (Carney, 2020). The paper notes that case firms use *fragmented thinking* and *partial narratives* to think about and explain green change. This reflects the complex and dynamic change situation faced by firms and difficulties in analysis and communication. This is likely to recreate their historic problems when managing and explaining their responses. *In contrast*, the theoretical narrative (section 3) and empirical narrative of change (section 4) form an integrated conceptual frame, and illustrate how integrated thinking in financial firms, stakeholders, and wider society can be achieved. This Green BTFF creates new opportunities for firm to think about climate change risks in a holistic way and to explain their thinking and actions in reporting.

The green BTFF is interpreted as means to overcome, in part, problems of bounded rationality (Simon, 1957). It is intended to guide thinking and use of heuristics by top teams and other agents in financial firms. It can therefore contribute to an enhanced 'ecological rationality' (Lejarraga, Pindard-Lejarraga, 2020) for decision makers by aiding the individual firm and wider finance community search for *heuristics* that generate good outcomes in this complex environment.

The aim is to aid decision makers to find and use heuristics that reflect superior strategies and activities when facing climate change and changing green economies and green finance. The strategies in the green BTFF include heuristics for the search of relevant information, and adaptations to analysis and decision behaviour in a world of climate change. Adapted activities and behaviours include financial firms actively learning how to become green oriented and developing knowledge of climate change and its impact on financial firms. They involve how they are clarifying sustainability aims and establishing their dominance over financial aims. They concern how firms are improving shared awareness and discussions amongst employees and stakeholders, and how they are conducting stress testing of both soft and hard factors. These are a basis to improve communications and reporting.

The integrated narratives in the green BTFF illustrate how case financial firms can develop their enabling structure (Mitleton-Kelly, 2003), mechanisms, interactions, and conditions, and their dynamic capabilities (Teece, 2007) relative to climate change risks and their competitors. The green BTFF highlights how they can use these combined factors and processes to transform financial resources in a way that satisfies complementary sustainability and financial aims in a way desired by financial firms and wider society.

Collectively the connected green heuristics, activities and strategic changes identified in the green BTFF are intended provide some structure to 'muddling through' (Lindblom, 1959) behaviour. They can reduce problems of partial narratives in areas such as strategic decisions, communications, and financial decision making. This illustrates how **integrated thinking and actions** about complexity and uncertainty, can be enhanced by using a green BTTF to explain change and support key connected activities in financial firms. The climate change debate indicates they must do this in an authentic and credible way to contribute to prevent or slow global warming, and associated risks. Given the evidence for climate change and pressures to adapt to a net zero world, they must recognise the primacy of sustainability concerns over financial aims, whilst continuing to deliver core financial functions and value.

5.3 Making a 'difference' through integrated thinking and actions – in the wider system

This paper argues that ideas in the green BTFF can be part of a larger conceptual framework *to promote integrated thinking and action in wider interconnected systems of many financial firms and stakeholders*. They can be used in co-operative, competitive, regulatory (advisory), and legislative (compulsive) settings.

Competition and market forces are traditionally seen as major drivers of change in the world of finance. These drive concurrent changes in financial products, financial markets, and financial firms. In this narrative, markets efficiently price new green financial products demanded by customers, and force other firms to reorganise to copy and deliver them. In the resource-based theory of the firm (Barney, 1991; Teece et al, 1997), 'winner' financial firms use their unique intangible advantages (SCA) and market forces to drive out weaker firms, and create wealth for shareholders (Hernick, 2019). This approach has been the historic basis to create climate change. Carney (2015) agues it will intensify the 'tragedy of the horizons'.

In contrast, **co-operation** has become a major driver of change and innovation in a world of climate change and green finance. The 'Green Finance Summit' (London, 2018 to 2021), Ethical Finance summit (2018 to 2021), Net Zero Finance Conference, (2021), and processes such as TCFD (2017) show that extensive cooperation and exchange of ideas is possible and seen as necessary. Networks such as the 'Green Bank Network' (2017), Net Zero campaigns, professional meetings and initiatives by governments and regulators are intensifying this co-operation and combined impact. This reflects the growing belief that finance capitalism and market mechanisms alone will not respond fast enough. Co-operation also involves using other frameworks such as SDGs (UNDP, 2016), and <IR> (IIRC, 2013). The green BTFF can be used with these to form part of a wider knowledge risk management strategy to influence 'influencers' in a wider public debate. They form additional ways to close the knowledge gaps in the field of practice. Such change in shared understanding by many financial firm agents and stakeholders is a basis to improve governance in the firm and increase accountability pressures on financial firms to deliver authentic and credible actions to reflect sustainability aims. These frameworks and the green BTFF can be also used by governments and inter government bodies such as the UN and EU to develop **legislation** as global laws (such as maritime, flight and space law). They can be *part of* the conceptual means to think how to direct all financial firms, within say a five-year horizon, to transform their activities and resources (financial and intangible) *in an integrated and explicit way*, to reduce global warning (Pettifor, Dawson, Hernick, 2019). Such legal requirements, if agreed,

would have to go beyond the conventional focus on financial resources and their risks, and focus on how to change the aims, intangibles, and capabilities in all major financial firms.

5.4 Making a 'difference' through new academic research programmes

The Green 'Behavioural theory of financial firm (green BTTF) is a response to climate change problem, and to limited research by traditional finance academics on climate change (Gendron et al (2013); Diaz-Rainey et al, 2017; Hong & Scheinkman, 2020). It forms new ways to close knowledge gaps in the field of academe. This can support development of an academic research programme about 'Green Finance' using a range of non-finance academic disciplines. This paper illustrates how researchers can use their alternative specialised academic non-financial disciplines (sociology, organisation, social behaviour, theory of firm etc), within the green BTFF framework, to analyse and research the non-financial context of financial firm phenomena in new ways. This can contribute to creating a knowledge "house with windows" and new research opportunities in the academic study of financial firms by recognising "the complexities of the context" (Keasey and Hudson, 2007) of their financial decisions and functions (Holland, 2019b). This enhanced understanding from the Green BTFF can also encourage a rethink of research and theory development in the field of finance (Gendron, & Smith-Lacroix, 2013). Two examples of areas of change are discussed concerning financial intermediation theory, and quantitative finance research.

The Green BTTF *complements* **financial intermediation theory** (Buckle et al, 2011; Holland, 2019b) by explaining the role of intangibles in the transformation of financial capital and risks and in the delivery of finance and financial services to economy. This provides new ways of 'connecting' *finance theory* to *theories about green oriented 'intangibles'* and to associated empirical insights about change in green finance. In theory terms this shows the need to connect *non finance theories* of green oriented financial context and social and knowledge intangibles to *theories of financial intermediation.* The latter include theories of Principal-Agents and transaction costs, Delegated monitoring, Liquidity production, and Asset transformation (Scholtens et al 2003). Holland (2019b) shows how this is done for a *finance oriented* BTFF. This analysis must be repeated for a green *oriented* BTFF to enhance the relevance of financial intermediation theory to green finance and to reflect joint Net Zero and financial aims.

In addition, green aspects of **quantitative finance research** can be rethought using the green BTFF. It could be hypothesised that the *degree of achievement of Net Zero aims* is a function of *connected* and *combined* changes in *key variables* in all of the empirical themes or metaphors. This **firm-wide hypothesis** (Poterba, 2021) of change in green finance differs from conventional quantitative finance studies by its focus on the whole system rather than parts. For example, Green BTFF could be used to hypothesize which factors are expected to predict 'success' as a green financial firm. For example, 'success' – could be defined in many ways as - Growth in green assets – Growth in profits from green finance – Improvement in firm green ranking – Reduction in activity on carbon finance deals or Increase in green finance transactions – or all of these. These measures of 'success' could be hypothesised as being associated with green changes in:

'Head' = Top team green leadership, green purpose, metrics, Climate change experts on board,

'House' = Existence of - Green aware decision teams and routines (top, middle management, front line),
& of - Green products, £s for new technology for carbon measurement,
& Green oriented incentives, green control systems

'Community' = New green training £s, increase in meetings to focus on green issues, customer engagement activity

'Machine' = Changes to green capital bases (debt short and long, and equity), and to a green capital structure
Stability of financial position of the firm relative to climate change risks

The above examples, support the development of an academic research programme about 'Green Finance'. The Green BTFF is thus a means to refocus attention and resources of traditional academic finance community and its

research 'engine' to promote 'the possibility of substantive change in the discipline of finance'(Gendron et al, 2013). This holistic approach to academic research has potential 'to make a difference' in; research, learning, thinking, and believing about financial firm and system responses to climate change (Shiller, 2019; King and Kay, 2020); amongst academics and practitioners. These are part of the evolving means to realign *value* in financial markets with *values* of wider society (Carney, 2020). This a key new research agenda in finance.

6. Conclusions

The aim of the paper has been to answer the research question *How can financial firms go green?* This involved change in complex systems. It was explored through empirical narratives and theory narratives (Golden-Biddle and Locke, 2007). These empirical and theory narratives formed a conceptual framework or a Green 'Behavioural theory of the financial firm' (green BTTF). The green BTFF forms a key part of a knowledge risk management strategy (Zack, 1999, La Torre. 2020) which directly addresses uncertainty and complexity by closing, in part, the **knowledge gap** (Holland, 2010) for academics *and* practitioners.

In the field of academe this enhanced understanding can support development of an academic research programme about 'Green Finance' using a range of non-finance academic disciplines. It can encourage a rethink of research and theory development in the field of finance (Gendron, & Smith-Lacroix, 2013). In the field of practice, the green BTTF has many potential uses 'to make a difference' in **learning, thinking, discussions, and action**s, by individual financial firms, and by co-operating and competing agents in the finance system and wider society. The agents include 'top teams', the rest of financial firm, advisory policy bodies, legislators, and regulators. They include civil society organisations (CSOs), customers, employees, citizens, and other stakeholders. The changes are part of the evolving set of means to realign value in financial markets with values of wider society (Carney, 2020). They are part of the ways to align financial firms; their suppliers and users of funds (companies and customers); with net zero aims. This also the basis to enhance collaboration amongst academics to critically analyse on how financial firms can and should go green. This knowledge is intended to inform academic research, and for this to play a more active role in the practitioner debate.

Thus, the green BTFF is part of an extended knowledge risk management strategy involving many wider system agents. In Shiller's (2019) terms, it has the potential to limit contagion of uniformed or oversimplified ideas about climate change and response of financial firms. This reflects Shiller's (2019) call for 'narrative economics' which has potential to improve collective ability (in markets, and wider society) to predict, prepare for, and lessen damage of climate change as well as financial crises, recessions, depressions, and other major economic events. This narrative and theory approach reflect King and Kay's (2020) argument that in the face of uncertainty decision makers should rely more on robust and resilient reference narratives, in which uncertainty is embraced as a source of creativity and benefit. Resilience will be enhanced if decision makers organise themselves guided by empirically and theoretically based narrative rather than conventional quantitative approaches offering spurious certainty.

The paper does not have the strengths of a single disciplinary approach or of formal testing of clearly specified hypotheses. The research question concerning change in complex systems has meant that a combined narrative and interdisciplinary theory approach has been adopted. These are the basis to convey the essence of the complex system and change process without being overburdened by the complexity of the phenomena

These narratives form a basis for firms and stakeholders to discuss how to improve non-financial reporting especially <IR> (Torre et al, 2018) and TCFD (2017) reports. The green BTFF and narrative provide new means to provide combined empirical and theory insights into the structure, content, and process in financial firm business models. They provide structure for forward looking reporting of content based on the structure of the business model. This can place scenario risk analysis (transition, and physical), of financial transactions and portfolios

pursuing net zero aims, in a meaningful context. These ideas reflect Ford et al's (2016) 4Cs of adaptation tracking – of consistency, comparability, comprehensiveness, and coherency- in financial firm reporting. Such improvement in disclosure is crucial to improving legitimacy of the financial firm (DiMaggio and Powell, 1991) with stakeholders (Guthrie and Parker, 1990).

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