Technology Investment Decision Making: An Integrated Analysis in UK Internet Banking

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for my mother
ABSTRACT

The research addresses the problem of technological investment decision making (TIDM) in UK Banks. It focuses on Internet Banking technologies and uses interviews with bank executives and industry practitioners to form a coherent understanding of how technological decisions are practically made and what, in that process, is the role of evaluation techniques. The aims of the research are (1) to identify and explain the discord between formal and practical evaluations of technologies, (2) to review the roles of expert professional groups in defining the norms of evaluation, and (3) to develop a model to reflect the reality of TIDM in UK banking. The ultimate aim is to contribute to reducing the ambiguity that notoriously characterises the evaluation of new technology.

According to the theoretical framework the TIDM problem is socially constructed by expert groups (actors) who either participate in decision-making or assume roles in developing methodologies for facilitating it. Its ultimate shape is the outcome of negotiations between these viewpoints, in light of expert power positions and political advocacy. Three classes of such “actors” are identified: (1) Practitioners, namely experts in Financial Institutions, (2) Observers, academic researchers, consultants and government bodies, and (3) the Community of Received Wisdom, comprising the commonly understood views on what TIDM is and how it should be made.

A novel methodological approach is introduced as a variant of Grounded Theory. Called Informed Grounded Theory (IGT), it proposes that viewpoints are by default informed by individuals’ academic and professional training; thus, past theory should not be considered as a contaminating factor for the data and their interpretation, (as Grounded Theory proposes) but as integral part of it.

The key findings of the research concern (1) the unconventional usage of financial and other formal methodologies in TIDM practice, (2) the highly political role of dominant expert groups and the resulting dynamics of their development, (3) the influence of the wider economic cycles on how technological value is perceived and (4) the changing role of the Finance function in technological investment justification. The core conclusion from these points is that TIDM in UK banks is an act of justification and advocacy, far more than it is an assessment process; valuation techniques play an ancillary role in ascertaining views often founded on purely strategic or political grounds.

The research recommends an interdisciplinary approach to improving TIDM methodologies. Unlike the traditional paradigm which might be characterised as improvable measurement, where measurement precision is sought as the solution to the valuation ambiguity, it is proposed that we seek improvement by taking explicit account of the perceptions of expert groups, as these are encoded into existing formal methodologies, and thus offer only partial evaluations. By mobilising these partialities, newer approaches may provide for including socio-political as well as economic factors in technological valuation processes.
I declare that this thesis has been composed by myself with the work my own and that this work has not been submitted for any other degree or professional qualification.

Georgios Samakovitis

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"I find it disturbing that pseudo-science can exist within our modern culture of scientific objectivity, but the possibility needs to be confronted. The phenomenon of garbage-in/garbage-out is alive and well in various fields of environmental, military, social, and political engineering. When the uncertainties in inputs are not revealed, the outputs of a quantitative analysis become meaningless. We have then entered the realm of pseudo-science where people put faith in numbers just because they are numbers."

J. Ravetz

Chapter 1: Introduction: The Problem of Decision Making for Technology Investments

Introduction: the question of technological value

Contemporary business practice is now, more than ever, faced with the question of the value of technology. Never has the value of technology been more openly debated than in the years since the so-called 'dot com boom and bust' cycle: On the one hand, the prevalence of Information and Communication Technologies (ICTs) has, in the last ten years or so, dramatically altered the shape and conduct of business and social life, and in so doing created a widespread belief that Information Technology (IT) carries significant intrinsic value that cannot be recorded with established measurement tools. On the other hand, this wide confidence in IT has apparently led to exaggerated perceptions of the value of technology – perceptions which collapsed under subsequent rationalisations of the wider economy during the 'dot-com bust'.

Taking a closer look at this particular technological revolution, three observations can be made: First, that it developed around the central role that information assumed in the emerging IT-centric structures; that role was extended and hugely magnified by the prevalence of Internet-based and customer-facing technologies that largely passed control of information on to the individual. Second, that the advent of the Internet has gradually

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removed many of the geographical limitations on business conduct. Thirdly, that the main reason for this great expansion of IT and its newly upgraded role has been the advance in secure data transmission that made it simpler for remote financial transactions to occur.

What follows from this is the realisation that the key dimension along which the dot com boom and bust occurred was the evaluation of costs and benefits of Information Technology and, notably, the public perceptions of what the value of technology is and how it can be estimated. It is the evaluation of the costs and benefits of Information Technology that this research is about. In particular, this work deals with the processes, techniques and practices of Technological Investment Appraisal in the financial services context. On another level, this work deals with the link between technological decision-making and the measurement of technological costs and benefits, a relationship that has traditionally been seen as directly reciprocal. To address the subject, this work focuses on the specific case of Internet Banking retail services – an upcoming, yet already mature, area where technological investments have been widely made and where the results of such investments are now more or less visible.

This chapter provides a brief introduction to the problem this research deals with and comments on the chosen methodological approaches. The discussion begins by addressing the motivations for conducting the research, its value and the potential usability of its results. A brief account of the research stance and approach to the problem follows. The chapter concludes with a review of the structure of this work where a chapter outline is presented.

**Motivations, Value and Usability of the Research**

The present work is an investigation into the processes used to inform decisions on new technologies in the UK banking sector. As part of that investigation, it assesses the relevant technological investment appraisal techniques available in academic and trade literatures. The research was inspired by the much-discussed controversy that swirls around the question of the effectiveness and correctness of current methods of assessing technology investments: it was further fuelled by empirical indications and general observations that suggested that the established practice of technological investment decision-making (TIDM) may be responsible for erroneous valuations and implementation failures.

The investigation is focused both thematically and geographically. The subject matter of the investigation is Internet Banking technology, and more specifically technologies that link directly to the customer-facing end. Adopting this focal point allows a broader view of all underlying technologies, i.e. it provides a top-down approach to the subject. The geographical focus is the UK financial services sector. The reasons for this are convenience,
industry maturity and market importance: this research was conducted in the UK, making access to UK bank information quite straightforward. The UK Internet Banking market is one of the most mature worldwide, which makes it much suitable for ex-post investigation. Finally, the UK market is one of the most robust and advanced in the world; developments in such markets are often precursors or indications to future advances in other, less developed, ones.

In addition, despite the existence of considerable theoretical and empirical research on IT investment appraisal, there is little, if any, evidence in the literature relevant to the appraisal of electronic financial services or e-commerce projects. The primary cause of this lack of evidence appears to lie in the excessive complexity of such projects, resulting from the effects of Internet-centred applications on the shape of the value chain in implementing firms. The new elements of the techno-economic complexity introduced by ICTs, such as the high rate of technical change suggest the increased need for appraisal techniques for ICT projects investment that will efficiently take account of such aspects.

Most important, investigating the assessment of IT projects in financial services offers insights into both the suitability of valuation techniques for TIDM and the actual practice of decision-making, as observed through empirical evidence. First, as regards valuation methodologies proposed for assessing technological investments, reviewing these may offer a clearer understanding of the assumptions underlying them, as well as the perceptions informing the experts who develop and use them. Such a review may also lead to conclusions about their suitability for TIDM, a task that is important for both implementing companies and investors, since it would offer directions into how investment decisions may improve in terms of the allocation of both financial and technological resources. Second, as regards the actual practice of TIDM, looking into the processes that prescribe technological decision-making in financial institutions is expected to provide a clearer picture of how valuation techniques relate to organisational processes and how, in turn, such processes are interpreted and used when decisions are made in practice. In this thesis, it is contended that the two activities - valuation and decision-making - are connected in a way which broadly negates the established belief that technological decisions are based on valuation outcomes.

Finally, focusing this research on the financial services sector presents further benefits: For one thing, there are valuable insights to be gained by examining the attitude towards IT investment taken by organisations in which the investment function itself forms a key operational component. For another, the great transformation that the financial services sector has gone through in the past few years offers a suitable test bed for investigating the

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2 Shared nature, universal accessibility and public availability of the Internet are some of the characteristics which underlie its salience as a delivery medium. Conversely, factors such as government social and tax policies, the lack of uniformity of uptake, infrastructure disparities between geographical locations etc. introduce uncertainties as to how precisely the Internet influences the value chain. A valuable account of the contribution of the Internet in the Value Chain is provided by Porter (2001).
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Chapter 1

role of both sector and firm-specific characteristics in investment appraisal of electronic financial services projects.

The Social Analysis of Technology approach: methodological considerations

This investigation began from the observation that, although an immense body of literature has addressed organisational decision-making for new technologies, very little work has been done to review how such techniques, tools or methodologies are in fact being used in practical TIDM, or indeed how technological decision-making is linked to the valuation of technological investments. That observation was complemented by a second one, namely that despite the proliferation of techniques, no improvement in technological decision-making can realistically be attributed to them; success or failure in TIDM appears as elusive as always. Therefore, the problem this research has to address is that of the relationship between methodologies and prescribed processes, on the one hand, and established TIDM practice, on the other.

Addressing that problematic requires an exploratory approach. This is, first, because no plausible hypothesis can be established and subsequently tested to show how valuation and decision-making are connected. A hypothesis-testing approach is most suited to quantitative social research, where the limits of the discussed problem are well-defined and where this simple structure more accurately reflects the research process itself: the scholar would identify the problem, formulate hypotheses and review the relevant literature to choose a method for investigating it; he or she would then define a dataset where the method would be applied and subsequently draw inferences on the validity of hypotheses, performance or efficiency of the chosen method and representative power of the specific research application.

The nature of the present research does not allow for that approach. The relationship between valuation and decision is highly complex and dynamic. It is largely defined by implicit socio-economic, rather than explicit, static, quantitative parameters. Both the activities of valuation and decision-making are social processes and, as such, need to be first addressed through empirical evidence and later conceptualised through theory generation. That grounded theoretical approach is the one which this thesis adopts. It begins by seeking to discover the boundaries of the investigated problem and explore possible methods that can be used in this discovery. It uses this process to illustrate the inefficiency of past theories to reflect the totality of the problem and concludes that there is scope for new theory. This approach also looks at methodologies used to locate, collect, process and
make sense of empirical data, to ultimately indicate one preferred method that would be followed throughout the whole work.

In using that approach, the broader position that this thesis adopts is that the TIDM problem described above is *socially constructed*. The different ways in which the problem is perceived by experts who deal with it effectively *defines* what the problem is (rather than *addressing* it as a pre-existing fact). TIDM is not an occurrence which is external to and independent of the individuals and groups who perform it. Rather, it is what they say and do about it – and ultimately how they perceive it – that *makes* TIDM a problem; it is the same perceptions that give TIDM the shape it currently has. The connotation of that approach is that, consequently, past theories of TIDM and practical attempts to address it, inform the perceptions of experts and the public about what TIDM is and how it should be dealt with.

The methodology chosen to accommodate the research design is that of case studies. However, case studies were not used in the traditional sense of examining a particular technological project in each of the companies. Instead, the focus was on examining how executives of different expertise and professional background perceived and dealt with TIDM in Internet Banking projects at large. Case studies were based on semi-structured interviews and, where available, documentary evidence that the firms provided. In following that approach, empirical data played a dual role in this research: first, a *substantive* role, where data was used to explore the subject that this research directly addresses, and second, an *exploratory* role, where data are used in conjunction with theoretical evidence to identify the boundaries of the addressed subject. In this respect the thesis discusses theory and empirical data in juxtaposition.

To accommodate the overall research stance, TIDM is treated in this thesis as a *management* problem, where the question of technological valuation and decision-making is seen as an empirical one, and where past theoretical and practical approaches to it play a historical role and determine knowledge on the subject and established norms of practice for addressing it. In that sense, TIDM is not looked at *through* the social science disciplines that traditionally dominated the research field, but instead they are used together with traditions of practice and empirical data to elucidate how technological investment valuation techniques and processes relate to decision-making practice. The term *Social Analysis of Technology* (SAT) is introduced in this thesis to describe that approach. SAT offers a research viewpoint that is differently informed from academic disciplines such as Finance, Accounting, IS/IT, Economics, Organisational Theory, Sociology, Cognitive Psychology or other academic traditions dealing with investment appraisal or decision-making. Academic viewpoints are addressed as interested contributions to the social construction of TIDM as well as elements that inform practitioner experts’ educational backgrounds and professional training. Instead of starting from any academic discipline, SAT uses experts’ opinions, provided in interviews, as disclosures of their own perception of TIDM which is, in turn, informed by academic disciplines.
The thesis is organised into ten chapters, forming four parts. These chapters and the ways they are linked together is the subject of the next section, where a chapter outline and their underlying rationales are discussed.

Chapter outline

The four parts of the thesis perform the tasks of (1) providing the theoretical framework and methodology, (2) describing the landscape in which the investigation takes place, (3) presenting and analysing the theoretical and empirical evidence and finally (4) bringing that evidence into the context of the theoretical framework and drawing conclusions from the overall investigation.

Chapter 2 addresses the theoretical dimensions of the problem, starting with a meta-theoretical taxonomy of established ways for organising and reviewing contributions to TIDM. The chapter concludes that that an Actor-based approach best serves the exploratory nature of this study. This approach views the TIDM problem through the lens of interested human agents ('Actors') and the interactions between them. Subsequently, it is explained how and why the perceptions of these actors are informed by their educational and professional background, embodied in their expertise. The term Actor-based Informed Grounded Theory (IGT) is used for that framework. The chapter then explains how Actor-based IGT is implemented to achieve two goals: First, to conclude that none of the existing theories for TIDM can fully accommodate the problem and, therefore, scope exists for generating exploratory theory; second, to offer a classification of Actors and suggest that the social construction of TIDM happens through the interaction between them. Three classes of Actors are introduced: Practitioners, Observers and the Community of Received Wisdom (CORW). Their compositions and roles in shaping TIDM reality is explained in the closing part of chapter 2.

Chapter 3 discusses the chosen methodologies and practices for collecting, processing and sensitising the empirical data. It discusses research methodology choices and presents the case for qualitative case studies and an interview-based approach as being most suited to the nature of the particular problem. It then looks into the details of the practical implementation of the data collection process. This descriptive part serves the additional purpose of explaining the dual role of empirical evidence (substantive and exploratory) in the context of the adopted Grounded Theoretical attitude. Chapter 3 closes Part 1 of the thesis.

Part 2 provides an historical review of banking technology in 20th Century Britain and then focuses on the case of Internet Banking and discusses the particular case studies. Chapter 4 carries out the former task. It offers a discussion of historical developments in banking technology and provides observations on the patterns of expertise and TIDM in the
sector. Chapter 5 focuses on the specific details of Internet Banking, beginning by outlining the current competitive environment in Britain and reviewing the main strategies followed by Internet Banking entrants. An account of the financial institutions used in the case studies is then made with particular reference to their strategies and attitudes to technological investments.

Part 3 of the thesis deals with the two main classes of Actors that were introduced in chapter 2 and the formulation of the so-called Anomaly of Practice as the main conceptualisation of how TIDM activity is performed in reality. Chapter 6 addresses Observers, the expert group that deals with TIDM techniques as a subject of research, policy formulation and commercial exploitation. The chapter begins by addressing the ambiguity that characterises the measurement of the value of technology and suggests that different research strands treat technological investment valuation in ways which are consistent to their founding disciplines, but incompatible with each other. It proposes that each research strand is informed by disparate perceptions and that, therefore, such perceptions should be taken into account when considering the TIDM problem. The chapter then examines three such broad research strands that explicitly deal with one or another form of technological valuation: Finance & Accounting, Information Systems/Information Technology (IS/IT) and Technology Policy/Technology Assessment (TP/TA). This review concludes that each research strand or discipline provides its own interpretation to TIDM, on the basis of their interests and research agendas. The chapter recommends that new approaches to technological valuation should concentrate on taking more explicit account of the disparity of differently-informed views in the academic field, as opposed to seeking improvement through accuracy of measurement.

Practitioners and their perceptions are discussed in chapter 7, where the main body of the empirical evidence is used. Chapter 7 first provides an analysis of the research findings on the basis of six main thematic entities that were developed during the empirical investigation. The main findings from the interviews are then conceptualised and organised after a suitable explanatory framework that identifies three key components of how TIDM reality is ultimately arrived at. In short, that framework suggests that formal processes and structures for TIDM in the firm are filtered through the implicit expert perceptions of practitioners to deliver the real decision-making activity and its outcomes. The analysis also identifies six pertinent expert groups of Practitioners in the investigated firms, each with disparate perceptions on what TIDM is and how it should be carried out. Each of these perceptions, the analysis suggests, is informed by educational and professional backgrounds and thus projects TIDM views that are different across expert groups.

The last chapter of Part 3, chapter 8, consolidates the reviews of Observers and Practitioners into the broad proposition of the process-practice dichotomy. That is the observation that prescribed processes – such as valuation techniques and formal in-firm procedures for TIDM – are quite different from the actual practical decision-making disclosed
in interviews. This observation is encapsulated into what is termed the Anomaly of Practice. The discussion begins by providing the theoretical and empirical antecedents of the process-practice dichotomy and the Anomaly of Practice. The theoretical discussion is driven by addressing the different views that the academic disciplines have traditionally adopted in addressing decision-making. The discussion of past empirical research contains a critical review of valuation methodologies and their underlying approaches with reference to the observations drawn from empirical data from the interviews. The chapter then provides a suitable framework for addressing the anomaly; that is developed, on the one hand, on the grounds of the empirical observations analysed in chapter 7 and, on the other, on the basis of the discussion of Observers' approaches, provided in chapter 6. The framework addresses the Anomaly in terms of how the Actors' attitude to the TIDM problem is developed in three distinctive settings: (1) that of Observers as developers of valuation techniques, (2) that of Practitioners as developers of in-firm prescribed processes for TIDM and (3) that of Practitioners as decision-makers. It is suggested that Actors in these three settings mobilise their expertise within different organisations (structures) towards different purposes in order to deliver different outputs; therefore their treatments of the same problem (TIDM) are incompatible to each other.

The fourth and final part of the thesis brings together the results of previous discussions and recapitulates them under the wider Actor-based IGT framework introduced in chapter 2. It begins by revisiting the wider form of the framework and explaining, in light of the discussions of preceding chapters, the roles of the three Actor classes (Practitioners, Observers and the CORW) in constructing TIDM reality. These three classes are subsequently discussed in detail with regard to the subcategories of Actors participating in them and the ways they interact. That discussion provides the full description of the conceptual framework for addressing the TIDM problem. The final conclusion provided in this chapter underlines that a better understanding of the TIDM problem can and should be reached by taking explicit account of the fact that experts' perceptions are informed by their disparate educational backgrounds and professional training. In this way, integration of existing techniques for TIDM may be reached by addressing them in their socio-economic context, namely as social processes rather than as isolated measurement exercises. This approach is distinguished from the conventional aggregation approach for developing new valuation methodologies. According to that approach - named the 'improvable measurement approach' in this thesis - techniques evolve within academic disciplines by seeking improvement through increased numeric accuracy or through more complete accounts of parameters.

The thesis ends with a discussion of research findings in chapter 10. These are organised under four subject areas that summarise the broad contributions of the research to improved understanding of TIDM. These are (1) reality of technological decisions, (2) the theoretical orientations that result from the Actor-based IGT framework, (3) the practice of
TIDM in UK financial services and (4) the integration approach for improving our understanding of TIDM and the techniques used to inform it.

Viability and Limitations

As with all research that attempts to elucidate socio-economic phenomena, this thesis comes with its limitations, mainly stemming from the nature of the theoretical framework, the methodological approach, and the broader aims that it tries to reach. These are briefly addressed below and discussed in more detail in the main body of the thesis.

The first comment relates to the goals pursued in this work. The overall research does not aim to deliver a new, more complete and rigorous assessment technique for technological investment valuation. On the contrary, its scope is to underline the limitations of the conventional improvable measurement approach and suggest that better understanding of TIDM can only be reached by taking account of experts' informed perceptions of the problem. In that spirit, the outcome of this thesis is a conceptual framework that embodies the different measurements of technological value, rather than a new measurement tool as such.

Second, how outputs of this research can be generalised is open to debate. The exploratory nature and structure of this research cannot guarantee that the resulting conceptual framework (i.e. the Actor-based IGT) may be applicable beyond the context of this work, namely the UK financial services. This is not only because of the highly contingent structure of expertise both in banks and in academic disciplines dealing with valuation, but also because the organisational decision-making activity is a complex undertaking that necessitates deep empirical investigation across industries in order to make generalisations.

Choice of methodology also comes with its limitations. Using company case studies based on semi-structured interviews and limited documentary evidence, the research made use of thirty interviews for its purposes. This approach introduces limitations of time, resources, accessibility and processing capacity, most of which are well-known disadvantages of qualitative research techniques. It is logical to assume that a larger number of interviews across a wider range of firms may have provided a richer sample. However, experience showed that once an adequate number of interviews are analysed, very little additional benefit arises from extra interviews. A final comment about the empirical data concerns its treatment during analysis; interviewees' statements and opinions are not treated as direct disclosures of true facts, however logical or consistent with received wisdom about TIDM. Rather, they are treated as viewpoints that are informed by respondents' educational background and professional training and, ultimately, as their own perceptions of the problem.
It should be underlined that this thesis does not aim to provide blanket answers as to the question of the value of technology. Fully covering the immense scope of the subject in a single piece of research would be impossible. As with all issues in economic life, this research can only claim to investigate and draw inferences about events in a particular context and historical circumstance. What it does aim to do, however, is to elucidate the reality of TIDM in UK banks by identifying and investigating the assumptions through which the TIDM problem is made visible to the specialised and public audience.

As a final comment, it is believed that the SAT approach to TIDM that is introduced in this thesis offers a coherent and viable model for addressing the disparities between processes and actual practice in TIDM. It is also believed that it provides a contribution to the wider problematic of the sociology of knowledge: it suggests that, just as any past attempts to discuss TIDM, SAT contributes an approach that is making use of these past attempts as constructs that inform new empirical evidence by being embodied in opinions disclosed in interviews. SAT is itself, however, yet another differently-informed attempt that, in the fullness of time, will itself be subject to review, together with other past attempts, with a view to further enhancing our understanding of TIDM in the future.
Chapter 2: Practitioners, Observers and the Community of Received Wisdom: The Informed Grounded Theory Approach to Technology Investment Decision-Making.

Introduction

In the previous chapter, the rationale for conducting this research was presented. To this end, I discussed the characteristics of Technological Investment Decisions and the role of IT and the Internet in the contemporary business environment. The inquiry was then focussed onto the Banking industry with regard to Internet-related applications. With this discussion, I introduced the environment of this research, the problems that it is faced with, and the potential approaches for dealing with them. I have furthermore underlined its aims and objectives and discussed its expected outcomes, usability and limitations.

This chapter addresses how the TIDM problem is approached in terms of its theoretical treatment. It begins by reviewing a number of options before proposing an Actor-based treatment as the most suitable. It briefly touches on what has previously been said and done about the problem of TIDM and looks at how past theories have addressed the problem. It concludes that none of these older contributions are complete and that new approaches should be developed in order to fully accommodate it. The chapter concludes by proposing that such a new theory can be arrived at by introducing a particular kind of Grounded-Theoretical\(^1\) methodology.

\(^1\) Grounded Theory was introduced initially as a technique for developing theory that is 'grounded' on data (Glaser & Strauss, 1967).
The chapter is divided in three parts: The first discusses how the Actor-based approach differs from other traditional approaches. The second part of the chapter discusses the use of Grounded Theory as the basis of theory-development. A methodological modification to the traditional Grounded-Theoretical approach, termed 'Informed Grounded Theory', is subsequently proposed. The third part of the chapter deals with the implementation of the Actor-based Informed Grounded Theory approach. It outlines previous theoretical treatments of the problem of TIDM and introduces the Actors and their categories. The chapter concludes that no past treatment has fully addressed the problem and suggests that the Actor-based approach offers scope for fresh theoretical development.


Selecting an appropriate method for dealing with a problem in Social Science involves making an epistemological choice. Ultimately it is about how the researcher gets to understand and come to terms with the meanings of reality and objectivity (Feldman, 2004). How we appreciate reality is directly linked with choosing the tools for investigating and interpreting it or - in terms of social research - deciding on the theoretical framework and methodology of the investigation. A theoretical framework is the founding layer of any piece of research. It is the set of postulates, assumptions and associations that will be followed to carry the complete argumentation through, towards establishing the validity of research results. This is the subject of this chapter. Methodology is about practically dealing with the empirical work and analysing the findings of fieldwork and is addressed in the next chapter.

This first part is a meta-theoretical discussion: it deals with how past theories may be reviewed in order to comprehend their contribution to our current understanding of TIDM, and introduces a model for doing so. The model through which a researcher reviews these theories plays a decisive role in determining how their relationships, roles and contributions to established knowledge are understood. This is because, as will be discussed later, scientific knowledge is organised in particular patterns.

The discussion begins by suggesting that there are a large number of ways to organise past relevant theories, with each way constituting a different meta-theoretical approach. It then offers a categorisation of these approaches and ultimately chooses to apply an Actor-based model. The broader argument for using this approach rests on the proposition that reality is socially constructed and that the totality of a problem is only identified by combining the partial perceptions of the problem advocated by various interested groups. In following this argument, the observation is made that there exist gaps
in established treatments of the TIDM problem, which fail to fully address the anomalies of practice in Investment Appraisal. This is why a new approach is necessary.

**A Model for Organising Theory.**

To address theoretical considerations of this research, I begin by looking at ordered approaches for reviewing theories. To do that, I first discuss the possible ways a social researcher could use to frame the investigated problem. This is not an exhaustive account of possibilities, but a taxonomy that is developed with two aims: (1) to reflect the development of my own thought processes during the research and (2) to identify established norms of social research and then scrutinise their suitability for this research. In other words, this is a dual task of organising my theoretical review of the problem and identifying the sources of this organisation in established research practices. I see the first as a necessary step in the practical research approach that I adopt, and the second as a means for informing this practical approach with knowledge of prior practice.

To best accommodate this task, a two-stage model is introduced to describe different approaches to a Social Science problem. The aim of this model is to provide the generic framework under which these approaches work. At the higher (or meta-theory) level, the model reflects the existence of a number of configurations within which past theories can coexist. At the lower level, each one of these configurations is comprised of past theories that, in the context of the specific configuration, address the investigated problem. Each configuration therefore represents one particular approach for using past contributions for addressing the same problem. In the same line of thinking, each configuration equally proposes a 'complete' treatment of the problem. The overall concept is diagrammatically explained in Fig. 2.1.

The configurations of theories are depicted as grey doughnuts. Notice that different approaches may well include the same theories, but viewed from different angles or in different context.

The model presented here offers an interpretation of available ways for dealing with a problem in Social Sciences. It represents how theories are organised in order to deal with problems in Social Science. This model is therefore of practical significance: in applying it to deal with the problem of TIDM, one is able to identify the approaches that reflect past attempts to address the problem. In the same spirit, it can be used to frame new configurations, as is done later in this work with the Actor-based approach.

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2 The term 'complete' is used here in the meaning of coherent and consistent rather than to denote holistic or total approaches. Such completeness is advocated by each meta-theoretical approach, on the internal assumption that it offers a full coverage of the issues that are relevant to the problem.
Figure 2.1: The meta-theoretical model: Focusing inside every 'approach' the researcher is to scrutinise each one of the contained theories to verify whether they address TIDM in a complete and satisfactory manner. Should they all fail to do so, the conclusion can be drawn that there is an 'interpretative gap' and that, therefore, there is scope for new theory to address the problem in a complete way, as none of the previous theories were able to.

Furthermore, this model reflects some of the ongoing issues on the subject of the Sociology of Knowledge. It proposes a categorisation of approaches, according to the way by which each approach ties theories together in order to produce a coherent treatment of the problem. That categorisation is the subject of the next few paragraphs. In its practical sense, it offers the ability to first choose among a number of available approaches and then closely look at theories through the chosen approach. This task offers a view of how otherwise disparate theories are combined into new scientific approaches to deal with a
problem. In extrapolation, this categorisation could be seen as a possible explanation of how new theories (or even new disciplines) are developed.

**Disciplinary, Mission-oriented, Tradition-based or Actor-based? Meta-theoretical choices for approaching theories.**

To identify the most suitable meta-theoretical approach, possible ways for approaching the problem are addressed, using the model of Fig. 2.1. The aim is to adopt an approach that manages to deal with the problem in its totality, involve past attempts to solve it, and explain their success or failure. Four such approaches are examined, the (1) **Disciplinary**, (2) **Mission-oriented**, (3) **Tradition-based** and (4) **Actor-based** approaches. This taxonomy practically reflects the *evolution* of research thinking in this thesis: It starts from looking at the world through the lens of disciplines, where the researcher identifies those with seeming relevance to the problem. It then moves from focusing on the formal taxonomy of knowledge (discipline-based), to focusing on why we need to address the problem (utility-based); this tactic is reflected in the Mission-oriented Approach where the researcher's aimed task guides the investigation throughout. Given the need to overcome the limitations of Disciplinary and Mission-oriented approaches, the potential emerges for dealing with a research problem by the traditional practical ways through which it has been addressed in the past. This Tradition-based approach (practice-based) presents its own limitations by restricting the review of past attempts to address TIDM to those which developed historically as practical ways for tackling the problem. Finally, the chosen approach in which the problem is addressed by taking account of the human agents — or 'actors' — who are related to, is introduced last. This is the Actor-based approach, where the problem is *constructed* by the perceptions, attitudes and practices of involved parties. This approach is substance-based in that it looks at how the problem itself is understood by human agents and how the established forms of knowledge (such as disciplines and research areas) influence their perceptions. It is considered most suitable for addressing the research problem in its full dimensions, as it manages to account for the past relevant theoretical treatments in the context of interests and disparate perceptions. The Actor-based approach is found to be both a complete way for treating theories and a sensible method for demarcating the problem.

The rationale for this taxonomy derives from observing how a problem can be treated within Social Research. It is based on how research thinking evolves from

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3 The subject of the development of scientific disciplines is extensively documented in the Sociology of Knowledge literature (see for example Mannheim (1976), Law (1973), Kuhn (1970), Ravetz (1971), Barnes (1977), and Whitley (1984)).

4 The term 'substance-based' is used to stress that, unlike the previous three approaches, the Actor-based approach is centred to the problem itself, rather than the established knowledge about the problem. It recognises, however, that this established knowledge directly influences the way that the problem is made visible and understood.
established forms of knowledge towards novel contributions stemming from the raw observation of events. Furthermore, the same rationale is linked (as later explained) to how the researcher is guided by established scientific practice to progress with his or her inquiry towards legitimising empirical findings. This is another evolutionary process in which the social scientist begins from recognised structures of scientific knowledge, before migrating to other forms when these structures are incapable of explaining his or her propositions or empirical findings. Overall, this taxonomy is introduced because it makes sense of interests and motives in research thinking in Social Sciences. It is also introduced because – as explained later – it offers a framework that, on the one hand, explains the political organisation of scientific knowledge, and, on the other, points towards a respective political organisation of the knowledge that develops around a real life problem, such as TIDM. I elaborate on the proposed taxonomy in the next few paragraphs.

The Disciplinary Approach

The Disciplinary approach is one where a research problem is looked at through the prism of a particular set of disciplines. According to this approach, the researcher selects which disciplines he or she considers relevant to the subject and visits them one by one to review what each one of them say about the problem. Despite its advantages, the Disciplinary approach has significant pitfalls. It is simplistic in that it is restricted by taxonomies of social research that are established solely on past theory and practice. It also assumes a mechanistic view: it fails to acknowledge that, since social life exists irrespective of disciplines and disciplines are ultimately only attempting to explain social life, problems in social science may well have dimensions that are not addressed by the chosen disciplines. Consequently, even if it were possible to use all available disciplines, this approach could still not guarantee completeness. A further problem is that the Disciplinary approach imposes a segmented view of the world, due to the way in which disciplines address particular problems in perfect separation to each other. The overall outlook of the disciplinary approach is illustrated in Fig. 2.2.

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5 Care should be taken here to avoid confusion between the term disciplinary as "one relating to an academic subject" (English Encarta Dictionary, (online version)) and Disciplinary as the approach mentioned in this work: the Disciplinary approach is one where the researcher accounts for the disciplines that have dealt with the problem, rather than a single discipline. To make the distinction, I use the term with a capital D for the latter case.

6 The existence of predefined sub-areas of research for each discipline and the usage of consistent background literatures are some such advantages.

7 The Disciplinary approach is not open to new explanations that may fall outside the system of rules of the concerned disciplines.
Figure 2.2: A representation of the Disciplinary Approach. In deciding that only disciplines 1, 2 and 3 are relevant to the problem, the risk of ignoring a significant part of the research problem is introduced. Notably, more than one Disciplinary approach can exist, with all bearing the same pitfall of incompleteness.

A further difficulty with the Disciplinary approach arises from the problem of selecting disciplines to cover the problem. Inevitably, this choice is greatly dependent on personal preferences of the researcher, as well as his or her propensity to view reality through the filter of past exposure to knowledge and research training. Finally, the Disciplinary approach can be considered self-contradicting: That a social phenomenon exists externally, according to the Positivist tradition, and can only be interpreted by its exposure to objective methods of observation, means that such objective measurement can only be achieved within a "value system" able to offer a consistent interpretation of reality. As theoretical disciplines of Social Science are value systems of this type, it follows that viewing a research problem through a particular discipline is consistent with the postulate of objective method that

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8 Disciplines can be viewed as filters through which we view reality: selecting to examine the social world through a set of such specific filters (i.e. taking the Disciplinary approach) is by no means equivalent to re-composing reality from its components. The Disciplinary approach is by definition a judgemental selection of past viewpoints.

9 A collection of concepts tied together with a network of rules and axioms.

10 Discipline is 'a rule or system of rules governing conduct or activity' (Encyclopaedia Britannica 2002, Electronic Edition)
Positivism advocates. Accordingly, viewing the social world through any particular discipline is necessarily tautological to using objective method (in the Positivist sense). This is because the definition of a discipline as a closed system assumes that the discipline in question is able to address any aspect of the social world within its own realms. The Disciplinary approach proposes that the researcher sequentially adopts the viewpoints of the chosen disciplines, one at a time. That in a Disciplinary approach the researcher moves from ‘objective method’ to ‘objective method’ (as he or she moves across disciplines) in each run, is self-contradictory in that there can only be one objective method according to Positivism.

The Mission – oriented Approach

The second approach for addressing a research problem is the Mission-oriented approach, so called because it begins from serving the aims of a research agenda to deliver a particular task. A generic diagrammatical analogue of the approach is provided in Figure 2.3. Here, the researcher begins by identifying what his or her motivation is for addressing the problem. This motivation dictates the dimensions that the researcher should focus on. In other words, by identifying why we want to address and solve the research problem, we generate some sense of direction as to what theoretical treatments we should use to arrive at the desired result. The Mission-oriented approach is different from the Disciplinary one primarily in that it adopts a utility-centred rather than a discipline-centred attitude to the research problem. The outcomes of this approach are contingent to the researcher’s interests on the problem and his skills. It also offers starting points rather than definitive suggestions about what are the key theoretical treatments to be considered.

While the Mission-oriented approach avoids the elementary restrictions of disciplines, it comes with a number of pitfalls. First, it is inevitably biased towards adapting the solution it proposes to the actual motive for developing the answer: the mission underlying the undertaking of the research prejudges the selection of theories as relevant to the problem. That attribute prevents the researcher from taking a broader view of the problem. Second, the Mission-oriented approach imposes a hierarchical ordering of theories: suggesting a starting point for addressing the problem comes with the assumption that the theory with which we should start our inquiry of the problem is the most pertinent one and that, consequently, all other theoretical treatments that we eventually come across are of secondary importance. Such assumptions may introduce an unjustified ranking of theoretical treatments according to their perceived importance.

A relevant treatment is provided by Pepper in his “World Hypotheses” (Lilienfeld, 1978, p8) where Pepper disregards the Dogmatism metaphor on the basis of mutual contradiction: “infallible authorities” often contradict one another or they may base their authority on an appeal to self-evidence, to commonsense principles.

In this respect, the Mission-oriented approach is political in nature due to its reliance on particular research agendas rather than on the pure motive for scientific knowledge.
Thirdly, since the outcome of the Mission-oriented approach depends on the researchers' aimed goals, this ranking could well be inconsistent between researchers investigating the same problem. In a similar manner, research missions inevitably have *disciplinary roots* in that social scientists within the same discipline are most likely to share motivations. In other words, since there is apparent disciplinary guidance to identifying motivations, the Mission-oriented approach risks becoming simply a proxy for approaching the problem through disciplines. Last but most important, adopting a Mission-oriented approach is equivalent to *framing* the investigated problem with focus to the observer – researcher, rather than to the parties or individuals (stakeholders) who are directly involved and, in so doing, neglects important dimensions of the problem itself.

**The Tradition-based approach**

Overcoming the drawbacks of the Disciplinary and Mission-oriented approaches leads us to the third approach in sequence, which I term the *Tradition-based* approach. Instead of relying on formal structures of knowledge (disciplines) or the purposes underlying the motivations to address a problem (missions), this approach is grounded on established traditions of decision-making. The term denotes the different available formalisations of the TIDM problem, not through scientific forms like academic disciplines, but through practical problem-solving approaches. Such practical approaches are established as 'traditions of
decision-making' by becoming accepted functional forms of behaviour towards practical problems that require decision-making.

The tradition-based approach draws much of its conceptual basis from the notion of *problem-based* specialisations in science that Law (1973) introduced. Notwithstanding that linkage, the tradition-based approach introduced here does not refer to problems which are commonly conceived by the wider public and scientific community in the clear terms that Law proposes (e.g. a disease, an environmental disaster, an economic crisis). That widespread recognition and sensitivity of such problems notably provide the basis for concrete treatment. After all, technological decision-making does not constitute a clearly specified problem in Law's terms; decisions are the core component of management activity and, because of that, TIDM is a different problem for each firm in each different situation. Traditions of decision-making, therefore, are modes of deciding within a 'comfort zone' of each organisation and its expert practitioners rather than focused scientific treatments. This is not to say that traditions are fully detached from disciplines and their understandings of TIDM, but rather to underline that this relationship is implicit: Disciplines inform the backgrounds of experts who participate in decision-making; in addition, disciplines influence traditions of decision-making by offering their broad attitudes to the problem. The risk-centred attitude of Finance, the satisficing attitude of Organisational Theory and the optimising attitude of Operations Research are examples of such discipline-driven attitudes. They *inform* traditions of decision-making: the risk-centred tradition in financial institutions is one such example; the standard rough 'back-of-the-envelope' estimation approach that was widely visible in manufacturing in the 1970s and 1980s is another; the optimising approach used in areas such as credit risk also adds to that variety.\(^\text{13}\)

Dealing with TIDM through traditions of decision-making clearly brings the discussion of TIDM approaches into a more pragmatic perspective by relying on how TIDM as a *practical problem* is conventionally dealt with, in various organisational conditions. This approach is free from the restrictions of the Disciplinary perspectives and the limitations introduced by their theoretical principles. It is also remote from the research motivations and priorities present in the Mission-oriented ones. On the contrary, it embodies established perceptions of the problem as they developed in the field of practice with a single motive in mind, namely to make the best perceived suitable decision on new technologies. Figure 2.4 represents the concept diagrammatically:

\(^{13}\) Similar examples are these of the introduction of NPV in the manufacturing industry on the basis of deficiencies of Payback (Hayes and Garvin, 1982) and the use of Cost-Benefit Analysis (CBA) in manufacturing only in larger-scale projects.
Figure 2.4: A representation of the Tradition-based Approach. Each Tradition of decision-making covers a part of the total problem and extends beyond the problem. The area marked as "Untapped Part of the Problem" exists (1) because a problem cannot be defined in full at a consistent level of detail through decision-making traditions and (2) because of the incomplete coverage of the problem by traditions as these evolve through time as 'comfortable' modes of decision-making.

Despite its advantages in surfacing the pragmatic side of decision-making, the Tradition-based approach bears some of the deficiencies of the two previous approaches. Decision-making traditions are outcomes of informed expert opinions in different organisational settings, which have endured the test of time and survived as standard quasi-scientific approaches to making decisions quicker and more efficient. This is often made through bypassing time and resource-consuming estimations, or directly applying standard computational frameworks. However, each of these approaches embodies a particular set of assumptions that practitioners have gradually become comfortable with in practising decision-making. To use decision-making traditions as the basis for reviewing past TIDM attempts is equivalent to accepting (in a same way as with disciplines) that these traditions can fully cover what has been said and done about TIDM in the past. That would be an implausible assumption because the tradition-based approach has to rely on the existing organisation of knowledge about traditions, thus simply drawing on the ones already formally identified in academic or trade literature. A further disadvantage is that it reproduces the underlying assumptions of each tradition – which are often opaque and implicit – without explicitly acknowledging them, thus not allowing the transparency required for addressing the problem in this research. Finally, decision-making traditions are most often embedded in the culture of an organisation or industry and do not distinguish TIDM from other types of decision activity. As such, they often do not take account of technology-specific elements.
On aggregate, the tradition-based approach fails to accomplish a coherent account of past attempts to address the TIDM problem because, despite drawing on the practical side of TIDM, it provides a rather blurred view of TIDM practice. Because traditions are distillations of particular expertises and practical goal-seeking rules, looking at TIDM through them would not take account of all the expert viewpoints actually involved in the process, neither would it allow us to investigate the roles of current academic or other research and the ways that they influence TIDM practice. It would only offer an historical view of how theory and practice for TIDM have been configured in past situations into comfortable modes of application. However illuminating for historians, that approach does little to offer a complete coverage of TIDM for the purpose of this thesis. Surfacing that deficiency leads to the introduction of the Actor-based approach, discussed in the following section.

**The Actor-based Approach**

In the *Actor-based* approach the investigated problem is seen in the presence of human agents - 'actors' (or groups of them) who have vested interests or indeed any other stake in the problem we investigate. A researcher who follows this approach first samples the 'social landscape' where the problem develops, and identifies the groups of participants, professionals, practitioners, researchers and observers that hold a stake in the investigated issue. He subsequently views the problem through the eyes of these interested parties, by also taking explicit account of relations that exist between them. He then examines (both on a theoretical and empirical basis) the attitude of these 'actors' towards the problem and the underlying disciplinary backgrounds that inform their professional training through respective theoretical treatments. It is precisely these treatments that form, for the researcher, a full account of the problem.

The Actor-based approach does not bear any connection to the well-documented notion of Actor Network Theory (ANT) (Callon, 1986; Latour, 1988). The definition of Actors in this work is markedly different from the one supported in ANT where artefacts or constructs, together with human agents are given active identity. Actor Networks involve the resultants of human actions, such as technologies, structures or objects in the wider set of acting agents that interact to deliver social phenomena. On the contrary, the Actor-based approach uses the notion of the human actor merely in its dramaturgical sense to signify that all social occurrences ultimately result from the interests and perceptions of individuals and groups who make active use of artefacts, constructs and structures to serve these interests and to accommodate these perceptions. The difference, therefore, between the Actor-based approach and ANT is that by awarding active status in artefacts and constructs ANT does little to identify the power of human agents and its exercise precisely through these

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14 Actor approaches are not new. Modelling the interaction between interested humans in decision-making is the most typical application; see for example Berkes and Folke 1998; Ostrom et al. 1994; Funtowicz et al. 1999 and more.
constructs. In the investigation on the reality of decision-making, that this thesis carries out, that aspect of the political human is crucial.

The Actor-based approach is based on the premise that the type of research problem this thesis addresses is socially constructed. The problem of Technology Investment Decision-Making exists because of (rather than irrespective of) the existence of ‘actors’ and the stances that they adopt in addressing it. This is why the Actor-based approach is able, in my view, to address the totality of the problem: “Technology Investment Decision-Making” as a problem is visible to us the way it is, precisely because of the presence of opposing views on what it should encompass and how it should be done, and also because of the efforts of the interested ‘actors’ to impose their view as the dominant one. It is this act of negotiation between the involved actors that gives the problem its current shape, and it is only by taking account of all these actors that we can synthesise it in its real dimensions.

The utility of the Actor-based approach as a way for looking into theories lies in that the attitude of actor-participants towards the problem results from their professional training and educational background. Professional training and education are, in turn, mostly influenced (if not determined) by the theoretical-disciplinary treatments that ‘actors’ are exposed to during and after their academic training and apprenticeships. Viewing the problem through its participating actors thus takes conscious account of the underlying theoretical treatments as these are embodied in academic or practitioner literatures.

The Actor-based approach appears to be more accommodating to the other three approaches for a number of reasons. To begin with, it is able to address the problem in its full extent. Its approach arises directly from the ways that actual problems are addressed in social life. That is primarily because it relies on the organisation of society in groups or collectives on the basis of common interests of all types. In other words, it is an approach based on natural socio-economic divisions.

Furthermore it is an effective combination of useful elements from the other three approaches: adopting an Actors approach includes a review of the disciplines that have provided treatments for the problem, since the researchers concerned with this task are accounted as actors in the problem. By the same token, it involves the motivations of practitioners and researchers alike for addressing the problem, thus accommodating the useful elements of the Mission-oriented approach. It also focuses on practice that the Tradition-based approach proposes, by giving an explicit role to it as a key source of TIDM reality. Thirdly, the Actor-based approach draws the landscape where the problem ‘lives’ by actively engaging the agents that currently participate in it, rather than by merely relying on past representations of the problem (theoretical or other). Rather than examining the problem in the shape that others have chosen to represent it in the past, it tries to

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15 This rationale is largely stemmed on the relevant notions of institutionalisation and the role of human actors in the social construction of reality (Berger & Luckman, (1969)).
reconstruct it by starting from the very parameters that give it its current shape. Fourthly, the Actor-based approach explicitly recognises the interrelation between the actors as one of the key dimensions of the problem\textsuperscript{16}. Actors are seen as constantly interacting around the problem and often having conflicting interests over particular aspects of it. This interaction is accommodated by the exercise of power or influence that cause particular perceptions, opinions and assumptions to prevail in the final outcome of the problem. A diagrammatical account of the Actor-based approach is provided on Figure 2.5.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{actor_based_diagram.png}
\caption{A representation of the Actor-based Approach. The Problem is fully described by taking account of the relevant actors' influence. The coverage of the Problem through Actors is complete, since the Problem is defined from (rather than exist separate from) their interests.}
\end{figure}

In regard to the introductory observations on the categorisation into Disciplinary, Mission-oriented, Tradition-based and Actor-based approaches, the movement from one approach to the next – in the order that these appear here – demarcates two trajectories: First, a transition from discipline-based (Disciplinary) to utility-based (Mission-oriented) to practice-based (Tradition-based) to, finally, substance-based (Actor) attitudes to social

\textsuperscript{16} Recognising how the 'units' of the approach (i.e. disciplines, research missions and traditions) interrelate is something that the Disciplinary, Mission-oriented and Tradition-based approaches respectively failed to do. Such 'units' are rather seen as standalone components of the 'puzzle' and no explicit meaning is given to the ways by which they link to each other.
science problems. Notably this transition comes as an outcome of the evolution of research thinking from established formal norms (such as disciplines) towards more exploratory approaches that touch on the substantive aspects, the 'raison d'être' of the problem and try to provide fresh interpretations of social occurrences, albeit making use of past theories. The second such trajectory refers to the evolutionary process explained early on in this chapter. This process (marked by the transition from existing configurations of knowledge and practice to raw expressions of opinion and interest) forms one of the key bases of the theoretical framework and is explained in detail in the next section.


Having chosen the Actor-based approach as the method for addressing the problem, this section is preoccupied with framing it within an adapted version of Grounded Theory, termed Informed Grounded Theory (IGT). This adaptation is proposed in light of the observation that the organisation of knowledge in Social Sciences is political in nature17 (see for example Barnes et al., 1996; Gibbons, 1994). The argument for introducing IGT as the shell for the Actor-based approach is that Actors' partial perceptions define (rather than externally address) the problem and that our account of them through empirical examination of data should explicitly acknowledge that they are informed by theories that attempted to address the problem in the past. Theories inform data through academic viewpoints as well as by determining the professional or educational background of practitioners. The political organisation of knowledge and the rationale of IGT are explained in the following sections.

The Political Organisation of Knowledge & the Actor-based approach.

The ways that scientific knowledge is organised into formal structures has long been the primary subject of the field of the Sociology of Knowledge. In its generic form, this organisation is a very relevant subject to the present research. This is because meta-theoretical approaches to the TIDM problem reflect, in their majority, that organisation of knowledge. In this line of thinking, among the four approaches discussed above, the first two

17 Similarly, the establishment of viewpoints in decision-making practice is equally political and driven by interests. That political nature of Decision-making in organisations is well documented in the literature (see for example Pettitgrew, 1978; Mintzberg, 1989; Huczynski, 2004; Fincham et al. 1994 and more).
(i.e. the Disciplinary, and Mission-oriented) effectively follow the established and self-reproducing structure of the existing organisation of knowledge\textsuperscript{18}, while the third (Tradition-based) is grounded on established norms of decision-making practice. The Actor-based approach, is offered as an alternative attitude that departs from these structures. It is introduced as a realistic and action-centred treatment of social science problems. It functions outside the established production of scientific knowledge whilst explicitly recognising its embodiment in the techniques, approaches and methods of Actors. Instead of relying on existing organisations of scientific knowledge (disciplines or research missions) the Actor-based approach seeks the solution by identifying the participants to the investigated problem and recognising the theories that inform their understanding of it. It is their very understanding of the problem that effectively defines the problem. The relation between the four approaches and the political organisation of knowledge is briefly addressed below.

Disciplinary approaches rely on existing formalisations of readily produced knowledge as disciplines. In these approaches the researcher uses knowledge in its already processed form, as this is expressed through academic bodies. In Disciplinary approaches, disciplines are seen as disinterested collectives of scientific knowledge (Mannheim, 1976). They are thus trusted by the researcher as sources he can use to address a problem in full. In other words, the working assumption is that every known aspect of social life has, in one way or another, been addressed through disciplines, and thus the researcher can ‘compose’ reality by visiting these. The Disciplinary approach, therefore, sees disciplines to be politically neutral and disinterested.

In adopting a Mission-oriented approach the researcher begins by seeking direction among disciplines in order to perform the research task, rather than using disciplines as the raw sources through which one can ‘compose’ reality and address problems. Instead, it moves towards seeking to address the problem by associating the researcher’s own reasons for addressing it (the mission), to knowledge formalised by disciplines (the means). Thus a Mission-oriented approach tries to leverage disciplinary knowledge to serve particular interests. It arises from a distillation of disciplinary knowledge in formations that serve the researcher’s interests and motivations. This is the natural outcome of the involvement of the researcher in the effort to solve the problem: all humans are interested and hence motivated to solve the problem by certain types of reward (Habermas, 1972; Lukacs, 1971; Barnes, 1977). Interestingly, the Mission-oriented approach does not query in any way the neutrality of disciplines. It inherits them as they are from the Disciplinary approach and uses personal motivation and interest of the researcher to direct him to that particular set of disciplines that can be used to address the problem best.

\textsuperscript{18} The very rationale of these approaches is a product of the formal organisation of academic knowledge: Addressing, for instance, the problem by reviewing disciplines (i.e. the Disciplinary approach) relies on the authority of disciplines as the right way for organising knowledge.
The relationship of the Tradition-based approach to the political organisation of knowledge is somewhat different from the one of the previous two approaches. Tradition-based approaches come from the researcher's belief that decision-making should be viewed as a problem-solving activity. Therefore, viewing the problem through traditions of decision-making sets the problem in its context of practice. However, traditions of decision-making as well constitute a particular form of established organisation of knowledge: that is the distilled and implicitly negotiated knowledge of decision-making practice that is formalised in the Traditions explained before. This organisation of knowledge into Traditions has indirect-only reference to relevant scientific knowledge of academic disciplines. However, it explicitly relies on accepting that the broad decision-making traditions are the only available systematic forms of knowledge on TIDM.

The evolution from Disciplinary to Mission-oriented to Tradition-based approaches accommodates, first, the political nature of social research, and, second, the wider prescribing role of established forms of knowledge: As to the first point, it starts from a set of objectified principles (Disciplines) and continues with justifying interest through the need for accomplishing a defined task (Mission-oriented). As to the second, that evolution cycle (Disciplinary – Mission-oriented – Tradition-based) proposes that the alternative route to addressing TIDM still relies on existing formalisations of knowledge, although not academic but practice-driven.

The Actor-based approach attempts, first, to recognise and ultimately leverage the political structure of social research explained above. Second, the Actor-based approach does not constrain this ascertainment solely to social research but goes on to argue that a similar prescriptive organisation of knowledge exists in the shape of Traditions of decision-making. The Actor-based approach identifies the whole structure underlying the organisation of knowledge and attaches motives and interests to researchers, bodies of knowledge (academic or practitioner-based) and ultimately disciplines. It does not view these interests as malign elements that contaminate reality. On the contrary, it recognises that they are an indispensable part of reality that we cannot and should not ignore. The Actor-based approach goes on to support that every individual or collective of individuals (i.e. Actors) who have interests in a particular Social Science problem, have their own understanding of it, precisely due to the above organisation of knowledge. In turn, the ways by which these Actors view the problem defines the reality of the problem. Each Actor establishes a specialised reality – specialised because it is filtered by his own perceptions, assumptions, or aspirations as these are prescribed by his educational and professional background. Addressing the totality of the problem is a task of identifying and addressing these perceived realities of all Actors.

The discussion on the political organisation of knowledge has effectively made the case for using Grounded Theory as the basis of this enquiry: to explicitly recognise that past
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attempts to address TIDM embody interests, whilst remaining outside established political organisations of knowledge (disciplines, missions or traditions), requires that we begin from empirical data to form new understanding of the problem, rather than from existing theories and test their validity. In extending that Grounded Theoretical view, it is proposed that the TIDM problem should be approached through the views of the Actors who participate in it. In the remaining sections of this chapter, the Actor-based approach is put in the context of that ‘Informed Grounded Theory’ (henceforth referred to as IGT). That is the theoretical framework for this thesis.

**Grounded Theory & its problematic.**

Because IGT is introduced in this work as an adapted version of Grounded Theory (Glaser & Strauss, 1967), we need to first state the basic concepts of the latter, and outline why the adaptation was required. To develop an understanding about what Grounded Theory is, one has to start from the observation that the term does not propose a theory per se, in the meaning that we are familiar with. Grounded Theory signifies a research strategy for the derivation of a theory that is grounded on data (Punch, 1998: 163), rather than a theory that explains social occurrences. Grounded Theory involves a strategy for conducting research and, in doing so, a methodology for drawing inferences from observations. It stems from what is known as theory generation (as opposed to theory verification) where the researcher develops theory from collecting and analysing data.

The overall proposition of Grounded Theory is that the researcher should develop theory through 'comparative method' (Easterby-Smith et al., 1996: 35) i.e. by observing the same event or process in different settings or situations. In broad terms, theorising that comes as a result of this observation may have the shape of a categorisation of societal events according to a certain attribute that is identified through observation (i.e. it follows inductive logic). This approach thus proposes the sequential development of substantive theory (or theory that derives from early observation in the particular data set) and more generalised formal theory, that develops at later stages when more sense is made of all types of observations. Grounded Theory as a research strategy suggests that the researcher should observe and analyse data, following intuition and making logical associations between concepts and observations that crop up during data analysis (May, 1997: 125). Using the Grounded Theory approach presupposes that the researcher maintains a holistic view of the research subject and that he or she goes in depth into the data for longer periods, in order to make sense of it and develop themes and patterns from it.\(^\text{19}\)

\(^{19}\) Grounded Theory comes with a set of proposed methodologies that link closely to the qualitative approaches. One apparent reason for this relation is that in Grounded Theory you start without a theory and try to develop one by analysing your data (Strauss & Corbin, 1990). The in-depth understanding
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Grounded Theory has been criticised for lacking rigour or precise method, but such criticism largely comes from proponents of positivism and theory verification. The response to that criticism is summarised in two points: (1) that, as the founders of Grounded Theory proposed (Glaser and Strauss, 1967), there are criteria in place to evaluate the quality of a theory derived through this method and (2) that although Grounded Theory does stem from theory generation, theories are generated through progressive verification as well (Punch, 1998: 167). Grounded Theory is an inductive method where deduction is nevertheless often necessary for testing the theoretical ideas that emerge as the research progresses.

The justification for adapting the GT method comes, yet again, from reviewing the nature of the problem and the research aims. Whereas it may have seemed suitable to utilise Grounded Theory in its original form to attempt a fresh, uninformed and disinterested approach to TIDM, it would be misleading to assume decision-making to be politically neutral. Accepting the political organisation of knowledge and the interested nature of human agents, we have no alternative but to re-address GT in light of these observations. The adapted version of GT, named Informed Grounded Theory (IGT), is explained and elaborated in the paragraphs that follow.

**Informed Grounded Theory.**

To explain the necessity for introducing IGT, we need first to turn to the deficiencies of GT with respect to the theory-data relationship. Grounded Theory assumes the existence of data outside theory. Theory is brought in to provide frames of reference for data, or to structure and explain them. Data, as they are exposed to observation, are free from any theory that has been used in the past to interpret them. For GT, the disciplinary influence of theory is treated as a contaminating factor from which data should somehow become purified. GT therefore views data apart from the theories used in the past to explain them. However, in doing that, it fails to recognise the theories that have informed the data in the past. On that matter, I contend that data is not independent from the rest of social activity and that, in turn, theory is part of precisely that social activity because it informs the educational and professional background of Actors who participate in the observed phenomena, and who shape the ‘data': interviewees’ opinions are not pure from the understanding of TIDM that they develop as educated and trained experts of Finance, Economics, IT, Law, Banking etc. That aspect is missed out from Grounded Theory: GT tends to isolate data from theory by viewing these two as divorced, as opposed to a system of mutually configuring and influencing entities (i.e. the Theory-Data system).

and analysis of data that this requires, reduces the importance of quantitative methods, due to their limited interpretative power in explaining why and how things happen.
Counter to that approach, by recognising the political organisation of knowledge this theory-data separation is denied. Data is theory-bound (Coombs, 1964) by virtue of the fact that Actors’ opinions are influenced by the theories informing their background. Informed Grounded Theory proposes to deal with that problem by considering the political organisation of knowledge. IGT contends that, because of this political organisation of knowledge, what is used as data (irrespective of what form this data has) is by definition informed by past theories. This happens because past theories influence the education or professional training of individuals who provide the data (e.g. through interviews or documents). It also happens because past theory informs the sets of rules that govern the ‘agreed reality’ between members of the same group of interested professionals (as, for example, IT professionals). Ultimately, theory is present in people’s everyday life due to the significant role of scientific knowledge in contemporary Western society. Science as a social activity is embedded in everyday knowledge that informs any aspect of rational arguments used to promote views or opinions. Therefore, theory as a formal expression of scientific thought is similarly important as to how reality is perceived and communicated.

IGT proposes that, instead of declaring agnosticism, the researcher should take explicit account of the theories that have attempted in the past to solve the investigated problem. It is only in the light of these theories that we are able to apply the Grounded Theoretical instruments which allow for new theory to develop. IGT, therefore, explicitly gives a functional position to theoretical treatments of the past by viewing them as the formalised outputs of the political organisation of knowledge that inform the data. Along this line, IGT recognises that several similarly structured approaches to theory exist (see Figure 2.1), each proposing a different outlook of the same problem. It thus recognises the landscape that this political organisation of knowledge creates, precisely by taking account of these approaches as different realities that follow from individuals’ or groups’ (i.e. Actors) conception of the world.

Most important, Informed Grounded Theory invokes the Actor-based approach in a seamless manner: According to the Actor-based approach, different perceptions of the same problem are advocated by different Actors. However, this taxonomy is invisible to Actors themselves because, to them, other Actors’ realities are undetectable. It is only transparent to the researcher using the Actor-based approach. IGT, on the other hand, proposes that these realities are contingent to Actors’ educational and professional backgrounds. It is only by taking account of these different realities, and by identifying their informed nature, that we are able to address the totality of the problem we investigate. The resulting framework is termed the ‘Actor-based IGT’. It not only refers to the method for addressing the problem but

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20 We are reminded here of the epistemological clarification offered by Mannheim: “Totality…is not an immediate and eternally valid vision of reality attributable only to a divine eye. …a total view implies both the assimilation and transcendence of the limitations of particular points of view. It represents the continuous process of the expansion of knowledge…” Mannheim (1975): 94.
also proposes an approach to making explicit reference and use of past theory within the
remits of Grounded Theory. A large part of the rationale for this theoretical framework has
been generated during and within the empirical part of this research. It is this particularity
that gives merit to the applicability of the Actor-based IGT on the specific problem of TIDM.
This subject is addressed in the next and final section of this chapter.

Informed Grounded Theory, Actors and Technological
Investment Decision Making: Applying the Theoretical
Framework.

This last section deals with how the overall Actor-based IGT treatment is applied on
the TIDM problem. It begins by briefly introducing the nature of TIDM and discussing the
relevance of Actors' informed perceptions of the problem to how the problem is defined and
treated. The discussion then shifts to the criteria by which Actor categories are decided, and
provides a classification of Actors into three types: Practitioners, Observers and the
Community of Received Wisdom. The practical applicability of the overall Actor-based IGT
model is readdressed in the presence of clearly defined Actors. A set of relevant conclusions
closes the discussion.

The Actor-based IGT Approach to Technology Investment
Decision-Making: an overview

It is contended in this work that theories that proclaim normative assessment for
TIDM offer only one of the facets for dealing with the problem: That facet is traditionally
based on viewpoints that start from Economics, Finance and Accounting and which address
other classes of problems (such as those of Capital Budgeting and Financial Valuation).
Historically, such viewpoints have dominated the areas relevant to investment, primarily due
to their focus on calculating pecuniary gain, which is of direct interest to individuals and
corporations. Their linkage to quantitative expression has historically signified their practical
applicability, which further reinforced this dominance (Desrossieres, 1998) Conversely,
numerous real-life examples remind us that theories of normative measurement can only
provide model explanations for a mere portion of problems. Reality is far more complex and
undetermined than current normative models seem to predict. This is where we turn to
looking into the actual TIDM practice and the events that demarcate it, to build the picture of
what really happens. From there, we seek explanations as to how and to what extent past theories fit that reality or not and look for new theories that provide better results.

The Actor-based Informed Grounded Theory is used to perform this task. IGT, unlike plain Grounded Theory, recognises that data embody past theoretical treatments and that, therefore, we need to take explicit account of how these previous treatments influence our current understanding of the problem. The Actor-based IGT goes further to propose that it is precisely these previous attempts that define the problem as expressed in its current form. In other words, if different approaches had been used previously, TIDM would be a very different problem. History therefore defines substance in its own right. This historical approach also proposes that, precisely because previous attempts define the problem, the theories that underlie them inform the opinions expressed by involved Actors - in our case of the interviewed practitioners.

At the present stage, the application of the Actor-based IGT is concerned with achieving two things: (1) identifying and categorising, if possible, the Actors who participate in the TIDM problem and, (2) locating the theoretical treatments that inform their opinions. The first task is derived by the adoption of the Actor-based approach. The second is one of closer observation of historical and substantive data on the development of expertise in the UK banking sector.

The Categorisation of Actors

Providing categories of Actors in TIDM is the first stage for ultimately locating who these Actors are. The term ‘Actor’ is used in this work to denote all human entities that relate, directly or indirectly, to the problem of TIDM. Such a relationship can range from active participation in decision-making processes, to development of academic theories on TIDM, to simple dealings with side aspects of TIDM, for purposes that are irrelevant to the problem per se. Actors can be individuals or groups acting as a collective. Such collectives may be of a consciously shared identity or, alternatively, may exist outside conscious structures, and merely happen to deal with the problem in similar manners, though for different reasons. In short, whether someone is considered an Actor in TIDM is defined by his or her interested position in the web of social activities around TIDM.

In the light of the above definitions, the categorisation of Actors is made by two dimensions: (1) their relationship to the decision-making activity and (2) their consciousness of identity. The first dimension is the most important one, as it effectively introduces a key point of distinction between Actors who have an advisory role as to TIDM from those who
have a hands-on performing one\textsuperscript{21}. Along that dimension, the distinctive element is that of responsibility and accountability for making the actual decisions.

On the other hand, the identity consciousness dimension addresses how common characteristics of Actors are perceived and organised by them. Identity consciousness refers to whether Actors share common ideas on TIDM in the knowledge that they do so, as part of a community characterised by these ideas. Using this dimension serves two purposes: First, it aims to involve the role of 'community power' in how Actors perceive the problem and how they act to defend their position as a common interest. Second, and most important, it underlines the crucial role of more irrelevant social structures in defining the TIDM problem. This latter characteristic helps addressing the totality of classes of Actors whose activity may influence TIDM.

On the grounds of this taxonomy, three categories of actors are identified, namely Practitioners, Observers and the Community of Received Wisdom. It should be noted that this categorisation is not the only possible one, nor does it propose an exhaustive account. However, in light of the disparities of Actors' viewpoints that the empirical data disclose, the proposed classification appears to provide a natural description of the social landscape around TIDM. The three wider categories of Actors are addressed in detail below.

Practitioners, Observers and the Community of Received Wisdom.

The term Practitioners refers to those professionals who are directly involved with the problem of TIDM as managers in the implementing firm. Their most important feature - and notably the one separating them from Observers - is that, as decision-makers, they are held accountable for their decisions, with often severe negative consequences in case they are found acting recklessly. Furthermore, Practitioners are characterised by increased consciousness of identity as stakeholders in the Financial Institution that employs them. They are additionally characterised by a second level of identity consciousness as experts of a specific field. Practitioner groups' attitudes are informed by common theoretical and disciplinary descents that characterise education and professional intellect. The disciplines of Finance, Economics, Accounting, Management Science, Banking and IS/IT dominate the field of TIDM in the Practitioners' space. The origins of this list are both historical and empirical. First, they are historical in that the premises of investment activity of any form have historically been put in place in the last half century by sciences relevant to economic practice (such as the first three from the list above). Furthermore, the tasks of technological

\textsuperscript{21} To use an example, the involvement of academic research with view to addressing investment appraisal naturally assumes an advisory role to TIDM. Similarly, consultants who are called-in to facilitate TIDM assume the task of recommending solutions but their role is far from making the decisions themselves. On the contrary, managers in financial institutions make decisions for which they are held responsible and accountable.
decision-making in the particular sector were carried through by specialities around Banking and Technology Implementation (i.e. the last three of the list). Second, they are empirical because this list is also derived from the empirical data of this work, where these groups were identified as key participants to TIDM.

On the basis of this discussion, Practitioners include Bankers, Actuaries, Economists, Accountants, Finance managers, IT, Marketing and Business managers. Legal professionals are also in the list because of the important role of regulatory requirements in the industry. These specialisations provide a list of professionals who, according to the empirical data of this work, have direct involvement to TIDM in the UK banking industry. Members within each group are also characterised by similar educational and professional backgrounds.

The second class of Actors, the Observers, comprises individuals or groups who professionally deal with the TIDM problem in a broadly advisory role. They are thus not held responsible or accountable for any technological decision, but they contribute to the problem of TIDM through developing facilitating tools or proposing informed solutions. They also have high identity consciousness. Observers largely fall into three key categories: (1) Academics, who address the problem of TIDM within the territories of their disciplines and research agendas; (2) researchers working for Governmental organisations, whose interests lie largely in the assessment of technology for policy and legislation purposes; and (3) IT or management consultants, whose professional interest is to develop and deliver assessments of particular technologies to the organisation, on demand. On aggregate, Observers are identified in this work as being academic or other researchers and consultants subscribing to the disciplines of Economics, Accounting, Finance, Management Science, Banking and IS/IT and Organisational Sciences.

The category of Observers also includes individuals or groups who deal with the problem of TIDM because they need to address it as a problem inhabiting their areas of professional activity and interest. These experts primarily populate the academic world, although their remit may be that of management consulting. Scholars from areas such as STS (Science and Technology Studies) or Systems Analysis fall into that category. Their approach involves theoretical viewpoints developed by groups who adopt a critical observational position and, by doing so, attempt to interpret empirical evidence outside or across the theoretical disciplines that dominate the area.

The third identified class of Actors is one characterised by low identity consciousness as to the TIDM problem. The term the Community of Received Wisdom, (CORW) is adopted for that class of Actors, because it incorporates the less visible Actors who influence what TIDM is and how it should be done. This category includes those classes

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22 It should be noted again that this division into sub-categories of Observers is neither unique nor exhaustive. It was devised through empirical observation of the TIDM landscape (through available literature and empirical material) and is introduced as a convenient structure.
of individuals or groups that have indirect interest in the problem per se but for whom solutions of the TIDM problem have significant impacts and consequences. These Actors do not necessarily have the clear sense of identity permeating Practitioners and Observers. The CORW consists of groups that either have a common spatial or ideological ground (e.g. regulatory bodies, professional communities, interest groups\(^{23}\)), or simply have ad hoc positions in societies and economic frameworks that by definition influence or become influenced by TIDM. Structures like Stock Markets and specialist press belong to this class. Membership of such groups cuts across the ones defined in the other two categories and may be more abstract in relation to the TIDM problem, which explains their low consciousness of identity. Broadly defined, the CORW is the set of practitioners, academics, investors, interest groups, formal & informal representatives of firms, government bodies and the international environment - in short, all actors having a de facto role in shaping 'common knowledge' or wider beliefs about the state of business.

Just as with Practitioners and Observers, Actors participating in the CORW do not exist or act in isolation to each other. Each possesses specialised knowledge that draws on a pool of commonly accepted truths and assumptions about the business world. This is a set of universally acknowledged rules that are taken to hold true within the current paradigm of business practice. The term paradigm is used here in a way similar to that defined by Kuhn (1969), through extending it to denote the open-ended expression of received knowledge in the business world, rather than solely in science\(^{24}\). What is also important is that the CORW is not seen in isolation from TIDM specialists (namely Practitioners and Observers). On the contrary, it interacts with them to deliver 'Received Wisdom'. The outcome of that interaction is best seen as one dominant interpretation of facts, partly a result of negotiations between social groups who offer their own interpretations about the same things, and partly the distillation of a number of pre-existing powerful views. A broader discussion on the CORW is provided in Chapter 9.

In the remaining part of this chapter, issues around the practical application of the chosen IGT framework will be clarified. Also the choice of the particular theoretical treatments that inform the Actors’ professional and educational background will be discussed. Further implications of this choice are also mentioned to finally recommend the holistic character of IGT for TIDM.

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\(^{23}\) Groups of that kind may be, for instance, the Financial Services Authority (FSA), the professional community of specialist press, bodies or associations of investors or professionals, wider industrial groups and more. Such configurations have only indirect links to TIDM in the UK banks in the sense that they interact with the problem implicitly. The relevant discussion is provided in chapter 9.

\(^{24}\) Law (1973) offers a brief account of Kuhn’s use of the term paradigm by referring to it as "...a scientific achievement that has been accepted by a substantial group of scientists, and is used by them as a basis for their scientific work..." (p. 276). He also mentions that "...Kuhn characterises science as a set of paradigm-sharing communities..." (p. 276).
Contributions of the Model to approaching TIDM: The choice of theoretical backgrounds

The overall rationale of the Actor-based IGT approach is that TIDM is a socially constructed problem. Decision-making concerning the adoption of new technologies in the banking sector is an activity defined (as opposed to simply influenced) by the Actors who participate in it as well as those who have direct or indirect interests linked to it. On the grounds that the TIDM problem develops through this mechanism, we seek to locate the sources that influence Actors' views. In doing this, we aim to (1) identify common grounds of professional training and education that inform these views and (2) locate the disciplines and theoretical antecedents that demarcate the established views on how TIDM should be made. This ultimately enables sketching the approaches of Actors. It is precisely because the TIDM problem is interest-driven that these approaches are only specialised views and that none of them addresses the totality of the problem. By definition, the existence of different views, each of which is informed by different bodies of knowledge, provides a set of different, and often conflicting, treatments of the TIDM problem. It is by taking account of each one of these treatments that one is able to address the totality of TIDM.

Empirical work by Fenton – O’Creevy et al. (2005) provided a useful subdivision of expert standpoints, to those arising from theoretical work and those grounded on practical day-to-day professional activity. The authors call the former as knowledge of ‘how the world works’ and the latter as ‘work the world’ techniques. The Actor-based IGT examines both, in the shape of research approaches, on the one hand, and practice, on the other. However, the main thesis here is that the educational background and professional training that inform opinions and viewpoints of Actors are rooted in the theoretical treatments of TIDM and the ways by which these are translated to the practitioner world. On that account, it is important to outline which these theoretical treatments are.

The list of theoretical treatments to TIDM comes from examining the professional backgrounds of both academic researchers and practitioners in the Financial Services sector who are closely involved in the process. It is completed by identifying further research areas, such as Technology Studies and Systems Theory, which - although not addressing the problem of investment decisions directly – attempt to explain practice through empirical evidence and subsequent theory formulation. All theoretical treatments, in one way or another, attempt to provide answers to the fundamental question of Technology Investment Decisions and propose models of best-practice for them. In this work, it is contended that

25 The distinction is made to tell apart the principles of Finance that permeate securities trading from the practical rules of thumb which, despite their apparent inconsistency with theory, provide guidance to profitable trading. Similarly, the thesis of this work is that, while on the one hand the research approaches to TIDM define ‘how the world works’, their practical day-to-day activity of TIDM consists of approaches to ‘work the world’ in order to deliver plausible decisions.
none of them is able to address the problem in its totality and therefore a more open Grounded Theory approach should be adopted.

The choice of the theoretical treatments that inform Actors' backgrounds is made by three criteria: (1) the dominant professional expert groups in UK banking, (2) the main academic research strands that deal with TIDM and (3) a set of additional academic and practitioner groups that deal with TIDM not as an subject of direct interest, but as an issue that is closely connected with other human activities that these disciplines address.

The first criterion comes from the identification of dominant professional expertise in the area of banking. Finance and Economics, Accounting, Banking, Management Science and IT are seen as the key backgrounds of banking professionals. Individuals within the same area share similar education and participate in similar practitioner communities (such as Professional Bodies), often informed by the same literature. They are furthermore most often employed to assume roles relevant to their prior education and expertise, and therefore are bound to carry, in one way or another, the influence of theories dominating their area. Although that empirical data indicates Legal professionals to hold a prominent position in decision-making processes, their educational background is not explicitly addressed here, because while they hold powerful positions as regards the Compliance function, their roles are not directly linked to the appraisal process.

The second criterion is that of academic standpoints. Attempts in the literature to address the issue of TIDM are most often based on theories developed within the sphere of the disciplines mentioned above. Finance and Economics have an obvious foothold in the area, since even investment itself as a concept is defined within these disciplines. Finance theory has a central interest in providing methodologies for the pecuniary appraisal of investments. Similarly, Accounting is involved in Technology Investments mostly at the level of reporting structures and how these are to accurately reflect the value of Technology's costs and benefits. Banking, on the other hand, whilst not directly involved as a discipline in the specific problem, assumes a more substantive role in the discussion; this is because the Banking discipline dictates the organisational and operational structure of financial institutions, and also because it defines, along with Finance and Economics, the particular nature of the business as to investment management, the attitudes to risk, and the subsequent structures. The role of the Management Science discipline is less operational and more relevant to hierarchical and managerial structures that bear significant impact on decision-making practices and processes; It furthermore provides ample contributions to the subject, primarily through the voluminous literature on Decision-Making. Finally, IS/IT has made a striking contribution to the problem of technology Investment Valuation, by recognising the inefficiencies of previous contributions of Finance, Economics and Accounting in addressing the particularities of Information Technology.

The third and final criterion is based on identifying academic bodies that assume the role of an out-disciplinary observer and provide critical views on Technology Investment and
Decision-Making; while not always attempting to address the problem directly, they offer alternative viewpoints on how to deal with similar problems. Two such bodies have been identified\(^{26}\). The first of these is the one of Science and Technology Studies (STS). STS scholars provide a different inter-disciplinary focus on problems relevant to technology. They do this by addressing issues relevant to implementation, innovation, knowledge management and notions relevant to the development of technology. They also seek interpretations of reality by identifying patterns of practice and inducing theory from them. The second such approach is that of Systems Thinking / Systems Theory and Cybernetics (Laszlo, 1996; Beer, 1972; Bertallanfy, 1968; Lillienfeld, 1978) that adopt a systems approach to identify patterns of process, practice, control and sustainability in organisations (viewed as systems). Again, TIDM is not directly addressable in Systems Thinking, however, decision-making processes and their control lie at the centre of their interest.

Concluding Comments: The Usability of the Model.

This chapter dealt with constructing and justifying a theoretical framework for this work. Its aims are (1) to establish the setting within which background theory is to be investigated and used to enrich our understanding of empirical data, (2) provide and justify the framework through which the arguments of this thesis will be delivered and (3) introduce the Actors who participate in defining and addressing the TIDM problem.

To achieve these aims, the issue was approached in three steps. The first proposed a taxonomy of possible approaches for addressing the theories that deal with Social Research problems. It provided a meta-theoretical framework that was used to identify four types of approaches to theory: Disciplinary, Mission-oriented, Tradition-based and Actor-based. Of these the first three belong to an established mechanism for organising academic knowledge, while the last, the Actor-based approach, was introduced as a realistic approach that is closer to the substance of the TIDM problem. The second step included a discussion of the necessity to adopt a theory-generation approach. Starting from Grounded Theory methodologies, an adapted version of it was proposed, attained by recognising the interwoven role of theory and data. That Informed Grounded Theory (IGT) approach contends that data is by definition informed in one way or another by the theoretical treatments that underlie the educational and professional backgrounds of Actors. This bundling of an Actor-based approach with an IGT methodological attitude describes the overall theoretical framework. The third and final step addressed how this theoretical

\(^{26}\) However, it is not suggested that these are the only ones. The purpose of the Actor-based IGT approach is not to provide exhaustive accounts of research strands which deal with TIDM, but to cover the field in adequate depth by taking account of the main broad influencers in the social construction of TIDM.
framework is implemented in the TIDM investigation. To do this, it analysed the conceptual landscape of the TIDM problem and began by identifying categories of Actors. It then defined who these Actors are and, finally, discussed the academic disciplines and theoretical approaches that lie behind those Actors' professional and educational backgrounds.

In the course of developing this framework, reference was made to aspects that largely belong to the field of the Sociology of Knowledge. These references were because academic and practical knowledge and the ways in which these are developed, legitimised and communicated is seen, in the context of this work, as paramount in technology decision-making processes and indeed in investment valuation practices. That the field of investment is traditionally dominated by quantitative disciplines is simply to say that the prevailing industry views on what investment is and how it should be done have found a legitimising agent in quantitative method of proof. As discussed in later parts of this work, it is aspects such as the distribution of power, the relations of expert groups and the patterns through which specialist knowledge develops that ultimately define – through a negotiated order – the value and validity of numbers produced in the investment appraisal process and, in turn, their role in the final technological decision-making.
Chapter 3: Research Methodology

Introduction

The previous chapter presented the theoretical framework for this thesis. This centred on the view that reality is socially constructed and therefore social phenomena can only be fully addressed by accounting for all the Actors who are, or state themselves to be, relevant to these phenomena. On this basis, an Actor-based taxonomy was offered, identifying Practitioners, Observers and the Community of Received Wisdom as the three basic Actor categories. It was proposed that, in visiting the views, perceptions and historical antecedents of these Actors through empirical data, we can show that these are specialised and interest-based accounts and conclude that none of them addresses the problem in its totality. In order to do that, we must adopt an Actor-based IGT approach which recognises these 'specialised realities' as mere components of the total problem.

This chapter discusses the tools used to implement that Actor-based IGT approach. Its main thesis is that adopting a social constructionist approach to this research can be sufficiently accommodated by the case-study, interview-based methodology. The key purpose of this chapter is to explain how and why this methodological approach was decided upon. It begins with a critical discussion of methodology considerations that stem from the theory-data relationship and the nature of the investigated problem. It then presents the case study and the semi-structured interviewing method and discusses the theoretical and practical justification for it, by comparing it with other methodologies. Having described the method, the chapter then provides an account of how this was implemented and how the
results were analysed. It concludes with an account of considerations that places the method in context with the researched subject and results.

Methodological Choices and Epistemological Considerations

In beginning an account of the methodological approach for this research, it is important to discuss the linkage of theory with data. Research technique is devoid of meaning when separated from the ordered and coherent formalisation of understanding of phenomena that theory offers. That discussion also provides a natural connection between the approaches to theory presented in the previous chapter, and the choice of empirical technique. These points are elaborated in the next section where reference is also made to the respective split between research doctrines. Drawing on those points, the necessary attributes of the methodological approach for this work are then discussed. This necessity is argued on the basis of three aspects: the epistemological merits of phenomenology; the nature of the investigated problem; and the chosen theoretical framework. This discussion provides the justification for choosing a semi-structured interviewing approach. In turn, the case for the overall research design of this work is finally made.

Linking Data with Theory

The merits of connecting empirical evidence to theories in Social Science are well documented in the literature. As theory\(^1\) stems from philosophical treatments of reality, one may seek the benefits of theorising observations by understanding philosophical issues. Easterby-Smith et al. (1991:21) consider a researcher's ability to address such philosophical aspects to be useful for a number of reasons: it may assist in clarifying the research design\(^2\); it can help the researcher identify which designs will be suitable for his research; and it can help the researcher identify or even develop designs he was previously unaware of. This primary linkage between data and theory can be seen as the foundation for the relationship between research observations and their interpretation.

Using a theoretical approach to any empirical investigation in Social Sciences – or theorising \(^3\) – helps a researcher place his or her enquiry into a frame of execution. Whether

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\(^1\) In broad terms, theory is the ability to explain and understand the findings of research within a conceptual framework that makes 'sense' of the data (May, 1997: 28). We conventionally speak of a theory as 'a general statement that summarises and organises knowledge by proposing a general relationship between events' (according to Robson (1993:18)) See also Punch (1998:16).

\(^2\) The literature suggests that different opinions exist on the definition of research design. At a general level, Ackoff (1953) and Miller (1991) include in it all the issues in planning and executing a research project, issues that extend from identifying the problem, to reporting the results. Denzin and Lincoln (1994) provide an account of research design where it serves the role of situating the researcher in the empirical world and connecting research questions to data.
we refer to the application, verification or falsification\(^3\) of an existing theory, or the development of a new one, theorising provides a guideline for defining whether a proposition is researchable, where an investigation should begin, where it may end, what forms of data would provide suitable evidence, and how the data should be processed. More importantly, theorising helps to clarify what the researcher seeks to find out: as the researcher’s original proposition can only rarely be directly answered, one often has to break this proposition down to more directly addressable research questions.

Additional value for theorising arises from the existence of different theoretical approaches, which offer a starting point and a set of broad frameworks for the researcher’s treatment and interpretation of events: contemporary social science theories have been developed through a wealth of past empirical research, and because of this, they provide a framework for deciding which methodologies can be applicable to which kind of research.

It is the researchers’ duty to become knowledgeable about the theories that might be relevant to their field of investigation. Obviously, this prevents wasting time and resources in reinventing a theory that already exists. Secondly, it gives access to treatments and viewpoints that they were not familiar with before, thus increasing their resource availability. Thirdly, by investigating the conditions that gave rise to these theories, researchers are able to judge how relevant these theories are to their own work. Existing theories have always been the starting points for the development of newer ones, through improvements, falsifications, or amendments of their scope: theoretical knowledge provides the appropriate impetus for incremental or radical development of further theories that interpret newer empirical findings in better ways.

The question of when a social researcher should begin theorising is of crucial importance. On the one hand, knowledge of theory is vital for deciding how to conduct research; on the other, one can never be practically certain of a method before one is well into the investigation. The question of “theory-first” vs. “data before theory” is extensively discussed in social research literature (Wolcott, 1992; Punch, 1998; May, 1997) and marks the distinction between two key research approaches, namely theory verification and theory generation (Punch, 1998: 16). Theory verification uses existing theory as a starting point, with the researcher deducing hypotheses from it and using data to test them. In theory verification\(^4\), theory comes first. Conversely, in theory generation the researcher begins with

\(^3\) The question of whether theories can be ‘verified’ has long been debated in the field of philosophy of social sciences. The debate has been pioneered in the seminal work of Karl Popper who contended that scientific laws and theories are falsifiable rather than verifiable: there is no method that is capable of showing to be true, or even probable, scientific laws on the basis of observational or experimental data (Putnam in Boyd et al, 1991: 121). In Popper’s words, “we can only accept a theory, but only in the sense that we select it as worthy to be subjected to further criticism and to the severest tests we can design” (Popper, 1959:419).

\(^4\) Theory verification is closely linked to the notion of deduction. May (1997: 30) refers to deduction as the practice by which we start from a theory about a particular aspect of social life and produce empirical evidence to test our theory. Similarly, theory generation is linked to the notion of induction, or the practice by which we examine a particular aspect of social life and derive our theories from the resultant data (Hughes and Sharrock, 1997: 69).
a set of observations and tries to develop a theory that frames or explains them. In theory
generation, data comes before theory. Therefore, whether theorising should precede data
collection depends on the objectives of the research in question.

The linkage of data with theory is connected to a split between the two key
theoretical traditions of social research: positivism and phenomenology. Research choices,
such as theory verification vs. generation and the use of qualitative or quantitative
methodologies, are very closely connected to choices between these doctrines. Establishing
an original stance towards one's research and grounding it in either of these key theoretical
traditions, marks the primary milestone for deciding how one is to approach the research
subject and what to seek from it. In making this choice, the researcher becomes more
focused on where to look for appropriate background theoretical work and, ultimately, more
informed about methodological choices.

The discussion about the merits of the two doctrines is well rehearsed in the 20th
century social science literature and thus is not provided here. What is important, however, is
that the researcher's choice between doctrines is crucial, not only with respect to the overall
research design and methodology that he adopts, but also with respect to the fundamental
stance that he maintains in the research: a positivist will adopt or develop a theory, deduce a
set of hypotheses from it and then seek enough data to provide quantitatively sufficient
evidence that his hypothesis was right or wrong in the first place. To further this evidence, or
even to expand his theory, he will often apply the same method on additional samples and
quantitatively measure the variance of his results across samples. Conversely, a
phenomenologist will start from an experience of his senses about a specific social
phenomenon and begin collecting data to make sense of whether and why this phenomenon
occurs. In the process of data collection he will continuously develop ideas for explaining his
observations, and ultimately formulate theoretical constructs to frame his explanations.

The reasons for adopting a phenomenological viewpoint for this work broadly come
from three closely linked considerations: first, the wider epistemological perspective on this
type of research and the respective disciplinary trajectories of scholars; second, the nature of
the particular problem itself; and finally, the choice of theoretical framework that was
presented in Chapter 2. I discuss these in the following section.

Attributes of the Methodological Approach: The Qualitative Perspective

One of the reasons for choosing phenomenology over positivism lies in a wider
epistemological disagreement with the logic of the positivist method for explaining social

5 For a complete account of the positivist and phenomenological approaches, see May (1997), Punch
occurrences. That we can derive an explanatory framework for social activity through hypothesis testing can be debated on multiple fronts: first, such treatment would rely on building incrementally on past theories, thus neglecting the potential of radical and disruptive research. Second, building a hypothesis to explain social phenomena relies on an artificial ‘binarisation’ of reality (i.e. the assumption that reality can be split into pairs of null-alternative hypotheses) that entails the risk of distorting the context of events and simplifying an otherwise complex problem. Thirdly, relying on quantitative analysis to argue a particular viewpoint leaves one highly vulnerable to different, and sometimes opposite, interpretations. Often the dominant interpretation will be that which has better political support or better consistency with past ‘proven’ theory (Easterby-Smith et al., 1991: 57-60). This again creates a dependency of new theory on previous ones, further diminishing the potential for radical theoretical interpretations. Finally, the exclusive adoption of quantitative analysis as the key interpretative tool in positivist research creates an artificial way for establishing facts.

A useful example is the observation that we can derive different results from statistical analysis by slight alterations in the sample synthesis. The meaning of such vulnerability is that no concrete conclusion can be held solely on the basis of statistical inference.

Strictly speaking, choosing phenomenology over positivism does not necessarily establish a proxy for choosing qualitative over quantitative techniques. The difference lies not in the essence of the technique but only in the role that the researcher needs to give to the method. In that spirit, quantitative technique is not ruled-out from phenomenology-grounded research. However, numerical results are treated as complementary and indicative as opposed to central proofs of a theory. Their explanatory power is not neglected. It is simply recognised that quantitative data are deprived of meaning outside their context and thus can tell us very little in isolation.

In addition to the wide epistemological justification, the choice of methodology is strongly related to the nature of the researched problem. Designing research strategy comes after and, with it, the choice of suitable tools for implementing it. The specificities of the TIDM problem are briefly discussed below.

The present research revolves around two foci: one that relates to TIDM and its motivations, mechanics and practice, and another which refers to the role of economic appraisal models and techniques in the overall decision-making process. Because of the pertinence of measuring economic value, the two are very closely connected and mutually influenced. Ultimately, the aim is to explore and unpack the reality of practice of such investment decisions. This research suggests that this reality is hidden behind established formal processes and mechanisms of disclosure to the outside world. It is subject to continuous negotiation between established opinions of different bodies of knowledge that

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6 Fuller discussions on the subject of the effects of political interests on research and science are provided in Hayek (1944): 165, 195-201, Easterby-Smith (1991): 46-54 and Pettigrew (1973): 52-65

7 This does not mean however that positivist research is open to usage of qualitative methods.
propose normative structures to define it. Addressing that reality, at the end, will enable us to synthesise a conceptual framework that will help us explain TIDM. Looked at from a methodological point of view, it is social process rather than any measurable entity (like performance or return) that we are focusing our attention on. As a result, the research design ought to accommodate techniques that address data in context to achieve realistic interpretation. On the contrary, seeing data in isolation from their sources, time or location would be equivalent to stripping them of meaning, which would render the data susceptible to unscientific manipulations. Second, recognising that data may be disclosed to us in a filtered form is equivalent to understanding that we should not consider this data to reflect objective reality but rather one of the many purposeful representations of reality, as seen through the eyes of a particular class of Actors\(^8\). This statement has two connotations: one, that data presented through these devices cannot be taken at face value as objective data\(^9\); and, two, that these data representations can, when adequately analysed, give away information about the assumptions, views and motivations of the Actors responsible for them.

In seeking further insight for phenomenology-driven methodologies, one may look at the history of epistemological attempts at addressing TIDM. Broadly speaking, the fact that there exist unexplained elements in technology investment decision-making, strengthens the possibility for a potential weakness of theories of Finance & Accounting, as well as Mathematical Economics to explain such activity within their own realms. To provide plausible explanations, disciplines often tend to try and link relevant sociological or behavioural approaches in mathematical models. This is possibly driven by the dominance of quantitative method over qualitative approaches in the field. It is furthermore enforced by an otherwise arbitrary reciprocation of mathematical proof to scientific justification. This dominance, I believe, is normal: theories that attempt to deal with investment are naturally grounded on motivations related to pecuniary issues: because of the interest of humans in economic gain, there have always been demands for normative assessment of investment and development of explanatory models that link numerically the invested amounts with their returns. Given that possible weakness of quantitative analysis and bearing in mind the complex nature of decision making, quantitative data is viewed in this research as useful only in a role that supports qualitative analysis.

Guidance for the choice of the methodological approach is offered, finally, from the respective choice of a theoretical framework. This is because of the natural relationship between theory and data in social research discussed above. The preference for qualitative

\(^8\) The data themselves may well be distorted because of the way they are presented. However the fact that they are presented as they do is an unchallengeable reality: the only thing we can take at face value is that the particular data are presented in a particular manner to us.

\(^9\) This is true in two respects: one, representation mechanisms may well mask-out significant information that is crucial for interpreting data and, two, the same mechanisms may distort data to serve particular political aims in the organisation. Thus there may be (1) undisclosed data and (2) distorted data.
methods is based on the very essence of Informed Grounded Theory: Because it suggests that the reality of TIDM is constructed from the specialised views of Actor groups, it follows that it is necessary to observe these views as they are presented by the Actor groups themselves. Furthermore, for the methodological approach to accommodate the chosen theoretical framework, it is crucial that observed phenomena are viewed and analysed in the context of the wider opinions held by actors on technology investment: such opinions can only be identified through qualitative study.

**The Role of Research Technique: accommodating the IGT framework**

The previous analysis concluded that the methods we need to adopt for this research should necessarily treat data in their context, recognise the existence of political mechanisms that filter data to serve specific goals and attach to them meanings that are as complete as possible. These techniques should furthermore make use of primary sources and leverage the very processes through which data are disclosed, in order to draw inferences where possible. More importantly, the preceding discussion laid out initial grounds for choosing semi-structured interviews to collect data.

What follows is a more focused discussion of research methods for this work, where the potential for using techniques other than Actor-based IGT is assessed, and their shortcomings noted. Surveys, questionnaires, structured interviews and ethnographic research techniques are discussed before the conclusion is reached that semi-structured interviewing provides adequate treatment. This discussion is followed by a generic exploration of practical issues around semi-structured interviewing where the merits of applying the method in this research are explained. In closing, this account brings the methodological discussion into the context of an overall Research Design. This Research Design is the subject of the third and final section of this chapter.

**Quantitative & Qualitative techniques as Research methods: the embodiment of belief**

In regard to the selection of practical tools for implementing the chosen Actor-based IGT approach, this section considers the suitability of different data collection techniques as primary or secondary methods. It concludes that most such techniques can and should only assume an ancillary role, with semi-structured interviewing assuming the leading one. This should be implemented in a Case-based context and facilitated by secondary data sources and analysis techniques. The overall discussion is divided in two parts: one addressing the usability of quantitative methods and the second focusing on the qualitative ones.
Furthermore, the latter part is expanded to a more focused review of ethnographic approaches, treated in a separate section. The reason for this is that ethnography (or participant observation) is one of the more qualified approaches for investigations of this type.

**The role of quantitative data: carrying Actors’ assumptions**

The stance towards quantitative data taken in this research is driven by the choice of a phenomenological, social constructionist viewpoint. The case for the explanatory power of numerical data belongs to the positivist paradigm that has been considered and rejected as insufficient for this work. Broadly speaking, statistical analysis of quantitative data only gives us part of the picture. As is well known, statistical results are subject to interpretation; interpretation is a human function performed by individuals or groups who serve – consciously or unconsciously – political goals, and who are motivated by numerous tangible or intangible interests. Seen from a different perspective, even if we neglect the subjectivity of human judgement, we cannot fail observing that numerical data, just as any type of information, are disclosed through filters beyond our control: what we see is not the objective quantities that an uninterested agent would measure if he had the means and direct access, but merely the output of a mechanism that does this measurement for a purpose and that discloses its outputs insofar as these serve its interests. The demand for objective data cannot therefore be satisfied through quantitative data collection and analysis. To expand the same argument, the techniques for statistical or other quantitative analysis are themselves politically charged: measurement within the remit of social sciences cannot be devoid of interest (Barnes 1977). In contrast, methods for its completion have been developed with a view to performing quantitative assessment to prove a scientific point or political position.

An illustration of this point can be made through the example of using Financial Statement (FS) data as sources for assessing investments. FS are one of the purest forms of quantitative data, as disclosed by the firms themselves. FS data are provided according to universal regulations and their issuers are regularly subjected to external audit by both private and state-run organisations. One could therefore claim that these are as objective as they can get and thus they can reliably be used to convey information about technological investment decisions. However, there are three main impediments in doing so, one related to the actual figures and what they represent and another two that are related to the very nature of the Financial Statement: (1) what is disclosed in annual reports cannot offer explicit indications as to the performance of particular projects, not even as to the real amounts invested. (2) even if financial statements did analyse all investments, the evidence they provide for assessing investment decisions would be inconclusive: it would arbitrarily connect good performance of a project to, say, a particular type of investment decision.
process or the use of a particular Investment Appraisal technique. (3) the information conveyed in FS is the output of purposeful reporting rather than a reflection of reality about spending and investment. FS convey particular kinds of information, both numerical and verbal, in a way that is closely defined to ensure homogeneity across different organisations. Information is presented in a particular format that can be legible and digestible by a particular cast of professionals (i.e. accountants) who then translate these into other report forms, in turn legible by investors.

In conclusion, it is apparent that the role of quantitative data in this research cannot be primary, and can and should be used only as secondary sources, in the form of indications for certain trajectories rather than as verifiers of reality. Models used for quantitative assessment in social science are themselves social constructs that in the hands of interested groups are used to promote particular viewpoints. Indeed, they can be seen as the instruments of objectification of such viewpoints and beliefs. In this account, they are far from offering the objectivity that the positivist tradition advocates.

Qualitative techniques and their quantitative interpretations

This section addresses the merits of numerical assessment in regard to quantitative analysis of data collected through qualitative techniques such as questionnaires, surveys and structured interviews. Such techniques, despite coming from qualitative research, form parts of quantitatively-grounded research designs. A number of common elements shared by these techniques render them unsuitable for primary roles in data collection and analysis.

Surveys and questionnaires can, in this research, only provide supporting information on semi-structured interview data. This is primarily due to the nature of the research: because the subject is the social construction of TIDM, the argumentation cannot rely on opinions and information disclosed in an isolated format and borne outside the context of the respondent's aggregate view on the problem. Surveys and questionnaires equally bear this risk: First, they only record responses to a predefined set of questions, which strips the results from context and prevents the researcher from discerning valuable insights that the data could provide otherwise. Second, because they are purpose-designed, they are susceptible to isolating the data the researcher views as interesting; this data is then subjected to statistical manipulation, often in order to formalise support of an already favoured opinion. Third, because all structured methods – as opposed to semi-structured interviews - incorporate clear-cut Q-A structures, they provide homogeneity in both questions and responses which, in turn, makes them suitable for clear systematic

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10 The social research literature provides numerous accounts of the deficiencies of these methods. Similar comments are made on structured interviews (Sapsford and Jupp, 1996: 112).
representation and analysis. While such analysis can be useful as supporting evidence, it can only tell us in numbers what the respondents have replied rather than disclose their specific perception on the surveyed subject. The 'reality' presented through a particular survey or questionnaire is one that the researcher constructs by selectively isolating and addressing issues of interest in very specific linguistic terms. It is often stripped from context and geared to recording responses in a format defined by the model that will be used for analysis.

In the same line of thinking, desk surveys can also only assume a secondary role in this research. Collecting data through a desk survey does not fit the needs of this research, because the collection and statistical analysis of numerically representable events (e.g. the number of 'successful' e-banking ventures) can only provide a description of what happened rather than indications of how or why it happened. Furthermore, because such data are provided by secondary sources, what they really provide is the particular interpretation of facts from the surveying organisation or body: A surveying body (e.g. a business database) only collects, categorises and presents the data that it judges suitable for its purpose, or relevant to its research aims or policy-related goals. Consequently, by retrieving survey data from such sources, we reproduce the views, assumptions, opinions and objectives of the data provider. Therefore this data cannot be taken to represent objective reality, but should rather be used to indicate the assumptions of the bodies of knowledge that inform this data. The researcher must take account of them because the existence of this data, shaped and presented in that particular format, is in its own right an unchallengeable fact.

Survey, questionnaire or quantitative data can only serve as expressions or formalisations of particular viewpoints. Using the Actor-based IGT approach cannot follow from quantitative analysis, as the latter operates within a normative framework that defines what particular measures mean for the data (i.e. it offers predefined interpretative rules that are based solely on numerical attributes rather than contextual interpretation). The key thesis in this respect is that data received from a secondary source (such as databases, journals, or surveys conducted by organisations) inadvertently embody the perceptions, assumptions and beliefs of those who formed and delivered these data. They are informed by the disciplinary and professional background of the respective bodies of knowledge and as such they can only gainfully employed to reflect the assumptions behind them. In other words, we use the data in the knowledge that they are politically charged.

**IGT and Ethnographic Methods: issues with participant observation**

In justifying using the Actor-based IGT as the basis for the methodology, one needs to underline the necessity for in-depth understanding of the setting where the investigation happens. This approach starts from the proposition that reality is composed by the
specialised perceptions of each ‘cast’ or body of knowledge. The researcher should be able
to engage with each of these realities, and from there draw more informed conclusions from
observed occurrences. The social research literature suggests that this level of familiarity is
attained through participant observation, or *ethnographic* approaches\(^\text{11}\). In the next few
paragraphs, it is established that in carrying out these tasks, the Actor-based IGT approach
can be sufficiently accommodated by semi-structured interviews and that the more detailed
ethnography option is not necessary\(^\text{12}\).

The typical ethnographic approach involves participant observation, a process
where the researcher sits as an independent observer in meetings or other social activities
to obtain a holistic view and become familiar with social processes (Punch, 1998: 185). In
the present research, that would be a role situated outside the professional groups of Actors
investigated. The involvement of the researcher-ethnographer in the organisation as a
simple observer would serve the purpose of synchronous observation of all groups and fit
the time restrictions imposed by research limitations (Easterby-Smith et al (1996: 100).
While this technique would allow for significant levels of familiarity with the subject, its use is
unnecessary for the present research.

A number of reasons exist for this. First, the objective of the empirical work of this
thesis is to provide an understanding of the perceptions of different individuals and groups
about the TIDM process. On that account, it is looking at the generic positions that Actors
adopt, rather than the intricacies of particular decisions. Because each decision happens in
a specific context, dictated by a large number of diverse parameters, much of what is
disclosed through participant observation may well be of little additional value to what semi-structure
interviews provide. Second, on another account, participant observation would
most likely be incomplete: the researcher’s participation in certain strategic TIDM meetings
may be obstructed, most often for reasons of sensitivity of the decisions. Similarly, where
participation would be possible, the researcher’s presence would risk influencing what is or
is not said in his presence. Furthermore, participation in TIDM meetings for the purpose of
this research would add little value: Technological decisions are not instant actions, neither
are they the clear output of sequential meetings. They grow through what are often opaque,
simultaneous developments in different hierarchical levels and across different
departments, on the basis of the perceptions of the problem advocated by Actors. Because
of that complexity, participant observation may not be able to add much to the researcher’s
understanding of Actors’ behaviour, since that behaviour is not always visible. Finally, the
ethnographic approach would not be able to accommodate the subject of this research

\(^{11}\) For a more detailed account of Ethnographic methods, see Agar (1996), Phillips (1976): 238-245,
Pettigrew (1973), 56-88.

\(^{12}\) This is not to condemn ethnography’s role in this research. Instead, it is contended that the depth
required in this research is adequately served by semi-structured interviewing. Ethnography can offer
far higher depth when researching the behaviours of one or a limited number of groups. On the
contrary, what this research aims is the in-depth understanding of more groups.
adequately. Because the investigation focuses on Internet Banking, a technology that had already gained momentum in the investigated firms at the time of the empirical research, it uses an ex-post account of historical decisions and takes advantage of the benefit of hindsight to draw conclusions on the dynamics of TIDM. That task cannot be accommodated at the required level by any form of direct researcher involvement.

The conclusion is that using participant observation in this work would not add much to delivering the desired research goals. On aggregate, by thoroughly looking at methodological alternatives, it was shown that all techniques other than semi-structured interviewing exhibit epistemological or practical deficiencies for accommodating the Actor-based IGT framework on which this research is grounded. The merits of the chosen semi-structured interviewing method are discussed in the following few paragraphs.

Using semi-structured interviews: reasons & justification

The term 'semi-structured interview' refers to an interviewing technique where the researcher applies open-ended queries, as opposed to strictly defined questions (Blaxter et al. 1998: 153). According to this technique, the researcher draws deliberately opaque boundaries around the discussed subject, in order to provide guidance for the conversation while at the same time avoiding restricting the respondent's scope with questions that demand very particular answers (Powney and Watts, 1987). The interviewee is left to freely discuss his views in response to the researcher's cues. The aim is to extract views that are more spontaneous and to engage the respondent in a casual conversation where informal opinions prevail (Burgess, 1982: 107). The benefits of semi-structured interviewing are multiple, not least in that it allows for general discussions on the subject at early stages whereby the researcher can develop their sense of the landscape. At later stages, discussions can become more focused without involving the amount of redesign effort that a structured interview would demand. Secondly, because of this inherent flexibility, the technique allows an interview to move in any direction the interviewer finds relevant and that the respondent wishes to follow. This ability can accommodate any exploratory possibilities that appear. Finally, it can easily fit a wide range of respondent backgrounds without involving severe redesign (May, 1997: 111). Because it does not restrict the conversation within homogeneous questions it can be easily aimed at people with explicitly diverse understandings of the issue.13 These aspects are discussed with reference to the present research in the following paragraphs.

Using semi-structured interviews for data collection has proved, in practice, very useful in its suitability to this research. This is true for two reasons: First, TIDM is a subject for which external observation data cannot easily be retrieved. The simple reason for this is

13 More in-depth discussions on the semi-structured interview as a research method can be found in Robson (1993): 237-243, Powney & Watts (1987), Easterby-Smith et al. (1991) and Finch (1986)
that decision-making processes hardly ever become subject to exposure and thus external observation. Rather, information on these processes can only be gathered from in-firm sources - and often from decision-makers themselves or Actors involved in decision-making. Apparently, when such individuals are interviewed, they will provide their own view of reality, their personal perceptions or beliefs and they will most likely defend their stance for reasons of consistency (Cialdini, 2001). Second, opinions and views received directly from individuals who participated in decision-making activities constitute data that are as objective as possible\textsuperscript{14}. This observation is counter to the wider belief among quantitative tradition researchers that interviewing - and especially semi-structured interviewing - lacks objectivity because it involves interviewee bias (Robson, 1993: 67-68). In my view, it is precisely that element of reported personal belief that adds to an interview's objectivity: interviewees' individual views, as well as the ways that they may choose to communicate these in the interview, are an indispensable part of reality. For one thing, a decision-making participant's personal view is indeed an active parameter to the outcome of the decision process and so it should be taken into account. For another, interviewees' emotional status, body language and ease of response to particular cues may disclose - or hint at - important information.

Furthermore, addressing interviewees of diverse backgrounds was necessitated by virtue of the IGT theoretical framework that views TIDM as an indirect outcome of all these backgrounds. Semi-structured interviewing has proved flexible in adapting to this requirement. Moreover, the technique has been useful in accommodating the often shifting focus\textsuperscript{15} and purpose of each interview and the particularities of each investigated company. It is noteworthy that the focus of the interview would intentionally not be explicitly predefined, as one would have to do with a questionnaire or a structured interview, but rather "negotiated" between the researcher and the interviewee within a range of subjects. This fuzziness contributed significantly to the information-richness that interviews entailed with regard to the interests, inclinations and biases\textsuperscript{16} of interviewees. The 'soft' nature of semi-structured interviewing allows the researcher to evolve the scope and focus of the discussion as they go, in a practice consistent with the exploratory nature of the particular research.

This discussion on the practical reasons for using semi-structured interviews concludes the section. What remains to be addressed in the third and final section is the Research Design, or the aggregate plan of execution of the empirical work.

\textsuperscript{14} On the contrary, relying on external sources that are, by definition, secondary to the researched subject carries the risk of bias of particular individuals informing these sources.

\textsuperscript{15} In practice, when managers with different job roles were interviewed, the focus of the discussion was regularly shifted towards their expert areas to capture their professional perspective on the matter of Technological Investment.

\textsuperscript{16} As regards bias, both that of the researcher as well as that of the respondent, this is not recognised as an unavoidable impediment but as a natural characteristic of social exchange and as a part of the observed phenomena. A similar treatment is provided in Mannheim (1976): (p. xx, Preface).
Developing and implementing the Research Design

The Actor-based IGT framework is accommodated by a research design that uses semi-structured interviewing as the primary technique. That design begins from ‘sensing’ the landscape and identifying aspects that appear to be pertinent for the TIDM subject and that, subsequently, need to be looked at. At the same time as making an initial review of what is available in the literature and elsewhere about the subject, a set of more directly addressable research questions are formulated. These form an initial basis for interview questions; the interviews are in turn used instrumentally to disclose the key subjects of concern in TIDM, as these are perceived by respondents. These subjects are then investigated in more depth through further interviewing and documentary evidence. This is the generic form of the research design for this thesis. Its detailed structure is discussed in the sections which follow.

With a view to addressing the development of a research design, the definition provided by Punch is used: Punch (1998) suggests that “research design is the basic plan for a piece of research and includes four main ideas: (1) strategy, (2) a conceptual framework, (3) the research question(s) and (4) tools and procedures for collecting and analysing empirical material”. Among the four elements that Punch identifies, the set of tools for performing data collection as well as the conceptual framework have already been addressed. What remain to be discussed are the overall strategy to be followed and the research questions. In addressing these, the discussion draws on the sources used, the techniques applied for designing interviews, rules of closure and the analytical frameworks used for concretising observations. A broad account of practical issues arising from the implementation of this research design concludes this part.

The Case-based Approach as Strategy

This account of research design begins with the broader element of research strategy. Choices in this area are clearly driven by (1) the nature of the questions that the researcher is seeking to address, (2) the levels of access to information available and (3) any resource limitations such as time or financial restrictions. These three criteria were carefully considered at the early stages of the research: First, the nature of the questions was defined by the subject matter of the research: that is TIDM in its formal and informal expressions of process and practice. From there, justifications or explanatory frameworks of why and how decisions happen the way they do were sought. Second, accessibility of the form and depth of information (i.e. direct exposure to viewpoints of professionals) was at the
early stages found satisfactory. This gave a solid indication that the necessary in-depth investigation was feasible. Third, resource and time limitations were known from the beginning, since the empirical work had to be completed with the least possible cost and within a rather short timeframe.

On the basis of these parameters, the methodological framework applied for data collection and management was that of a series of semi-structured interviews, based on case studies. According to this approach, interviews are carried out with professionals of different particular backgrounds, as the Actor-based IGT approach indicates. These interviews are organised by firm in order to illustrate practice and process in organisations. The approach followed is different from the traditional in-depth Case Study implementation (see Yin(1984)). Unlike what the researcher does in a conventional Case Study research, this study does not focus on particular projects within the organisation, but rather addresses the subject at the firm level.

There are three reasons for following this strategy. The first is that extracting detail about a particular project does not add to the investigation more than interviews focusing on generic stances. This is because developing a fully detailed picture of specific projects is not relevant to the aims of this research. Instead the case-based approach used here takes the inquiry to a higher level: It addresses the viewpoints of professional bodies on the wider portfolio of technology investments within the firm. The rationale behind this is based on the need to avoid getting involved in high levels of detail particular to any one project; this could sidetrack the researcher away from the processes and practice that are central to the study. The researcher would risk becoming absorbed into the procedural intricacies of specific projects, which can be very particular to the political, economic, or technological conditions prevailing at the time of the project. The second reason is that looking at cases at the firm level provides the necessary focus to the higher-level roles of experts in the firm’s TIDM procedures rather than those assigned in any particular project. Because of the local particularities of any IT project and the shifting roles of individuals in them, it would only be possible to address the perceptions of expert groups by looking at multiple projects in each firm. That would require longer periods of investigation. The third reason for addressing case studies at the firm level is that Internet Banking projects are large, complex sequences of smaller dispersed projects and thus cannot be easily viewed as whole units. Because of the length of time involved, individuals’ project roles are most likely to change during the course of the project. That would impose the need for interviewing a large number of individuals, whom it may even be impossible to locate due to the high employment mobility in the sector.

The particular case study approach is expertise-focused. It aims to provide a picture of the understandings, assumptions, perceptions and professional biases of decision-makers or other Actors. To provide this at the required general level can only be achieved by
Georgios Samakovitis Chapter 3

maintaining focus on the decision-making process across the organisational spectrum. This is accommodated by the semi-structured interviewing approach, where opinions and understandings about e-banking are disclosed.

Broadly speaking, that case-based approach provides context for the semi-structured interviews. In following this method, the interviews are accompanied, where possible, by secondary documentary resources to enrich the information base (rather than to cross-check the objectivity of what is said). Other published information is used as background for the firm in relation to its wider environment. The method therefore involves using any available secondary data to complement the context of the investigation or provide information that is too trivial to draw from interviews.

Desk research played an important role, particularly through the earlier stages of the empirical work. This involved using publicly available data to obtain a better understanding of the shape of UK banking\(^{17}\). Attention was also given to identifying the pertinent contemporary issues and problems the industry faces, to ensure awareness of the reference terms or the particular period. This task of 'sensing the landscape' is dealt with in Chapters 4 and 5 where the Banking sector is discussed.

Selecting the financial institutions on which the case studies were drawn was made with reference to (1) the key industry players, (2) the higher levels of publicity of specific Internet Banking projects and (3) accessibility of the relevant experts in firms. This was a continuous process that began with early desk research and continued through a networking process and screening of suitable interviewees. Through that process, the wider sample of candidate firms was initially defined. That was later reduced on the basis of accessibility limitations and information availability. Chapter 5 deals with the sample of participating firms in detail.

With regard to the number of interviews that conclude the empirical investigation, there are two aspects to be addressed: the total number of interviews; and the number of interviews per case or organisation. As to the first, the determining factor for concluding empirical research is closure, namely the reoccurrence of similar information and the ascertainment of what had already been concluded from previous interviews (May, 1997:111). The second point is addressed with the use of the outrigger model\(^{18}\), where a minimal number of companies (two to three) are being dealt with extensively in order to provide the basis for the empirical findings, which are then reinforced through interviews across a wider range of firms. That approach is based on the observation that a critical amount of information can be obtained from a small number of companies (the primary cases), through a larger number of interviews. Following this, the amount of new information

\(^{17}\) Mainly industry news published in specialised trade journals. Sources include The Banker, Banking Technology, Datamonitor’s Banking Business Review and The Economist

\(^{18}\) For this model, I am indebted to Prof. James Fleck who originally recommended the research approach and the term 'outrigger'. The term is used metaphorically to signify the supplementary role of the supporting case studies, in that these function in the same way as lateral support floats in the outrigger canoe.
or insights on the subject of TIDM is minimised as we investigate more firms (i.e. the supporting cases). As a result, we can address new firms in less detail (i.e. through a small number of interviews per firm), and use new data to generalise or assert what was already disclosed.

**Implementing Interviews: from conception to application**

This section discusses practical considerations on the implementation of the research design. These considerations are made on the grounds of the disparity between theory and practice in research methodologies. This is because theoretical treatments of research design are a form of planning for its practical implementation, in the presence of uncertainty. Therefore, this section provides a brief account of the steps followed and the models through which these steps were formalised. The next few paragraphs include a review of the process of theoretical sampling and an explanation of how the interviews came to take the shape they did.

Technically, designing and implementing the semi-structured interviews can broadly be described as a sequence of 4-step iterations that continued until closure was reached: this included (1) design of the interview questions, (2) interviewing, (3) interpreting interview results and (4) identifying new questions or improving and focusing the existing ones. The iteration was followed until closure was reached. The process is illustrated in Fig. 3.1 below.

In practice, the process started by establishing the overall picture of Internet Banking in the UK and locating the key problems around it. This was carried out initially through background research, based on academic and trade journals and other 'grey literature' (such as Internet sources and the business press). Understanding the UK Internet Banking outlook and examining the background of the key players in the area helped to derive a set of initial research questions. These were identified before the interviewing process began and were, where appropriate, communicated to potential interviewees. A list of these questions is provided here:
Figure 3.1: The four-step iterations in designing and optimising the semi-structured interviews.

(1). Is there specific treatment in the appraisal of technology projects, as opposed to other projects in the financial services sector?

(2). What are the most common approaches to investment appraisal of technology among firms in the UK financial sector?

(3). Is there any formal mechanism for post-implementation assessment of such decisions in these firms?

(4). Which are, if any, the most important IT-related aspects that are omitted in such investment decisions?

(5). Are there any firm or sector-specific elements that play a decisive role in how these firms treat IT projects?

(6). What is the relation between investment appraisal processes and final decision-making?

(7). Is the incidence of many e-business failures affecting the treatment of the appraisal process in electronic financial services for firms?

(8). Which are, if any, the differences between the theoretical treatment of investment appraisal and the practical perceptions and usage of it?

As was suggested above, these questions served merely as a starting set for designing the semi-structured interviews. They did not assume the traditional role of directly answerable queries (Robson, 1993: 44, Punch, 1998:34). They were adapted and, in several cases, totally altered on the basis of what interviewees perceived to be the most important aspects of TIDM. This was a natural process, since the focus of the investigation was also shifting as it became more informed by empirical data.
<table>
<thead>
<tr>
<th>Code</th>
<th>Position</th>
<th>Expertise</th>
<th>Background / Past positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Head of Strategy &amp; Research – E-commerce &amp; Internet</td>
<td>Banking</td>
<td>Product Manager</td>
</tr>
<tr>
<td>2</td>
<td>Retail Banking Director</td>
<td>Economist,</td>
<td>Public Policy - Academic</td>
</tr>
<tr>
<td>2</td>
<td>Decision Support Manager - Retail Finance</td>
<td>Accountant,</td>
<td>Decision Support Manager - previously in Insurance</td>
</tr>
<tr>
<td>2</td>
<td>IT Security Consultant</td>
<td>IT</td>
<td>security consultant / security management</td>
</tr>
<tr>
<td>2</td>
<td>Retail Direct Finance - Investment Appraisal</td>
<td>Accountant</td>
<td>Finance, P&amp;L management</td>
</tr>
<tr>
<td>2</td>
<td>IT e-commerce Investment Appraisal</td>
<td>Accountant, Business analyst, Systems Programmer.</td>
<td>IT project manager</td>
</tr>
<tr>
<td>2</td>
<td>Retail Direct Strategy and Planning</td>
<td>IT</td>
<td>branch EDP</td>
</tr>
<tr>
<td>2</td>
<td>MIS - Group Finance</td>
<td>MIS – IT</td>
<td>data warehousing / IT implementation</td>
</tr>
<tr>
<td>10</td>
<td>Finance Director</td>
<td>Accountant, MBA</td>
<td>commercial property financing, corporate finance, M&amp;A, Business Strategy</td>
</tr>
<tr>
<td>10</td>
<td>IT &amp; Business Design Director</td>
<td>MIS – IT</td>
<td>IT manager / Business Finance</td>
</tr>
<tr>
<td>10</td>
<td>Head of Applications Development</td>
<td>IT developer</td>
<td>corporate banking IT - Internet Banking development</td>
</tr>
<tr>
<td>10</td>
<td>Head of Business Design -Head of Sales &amp; Service</td>
<td>IT – Marketing</td>
<td>Customer care / IT</td>
</tr>
<tr>
<td>10</td>
<td>Change Management</td>
<td>Banking</td>
<td>Change management / process re-engineering</td>
</tr>
<tr>
<td>5</td>
<td>Head of Commercial Management, Digital Distribution</td>
<td>Banking &amp; Finance</td>
<td>corporate finance</td>
</tr>
<tr>
<td>5</td>
<td>Finance Team</td>
<td>Actuary</td>
<td>actuarial technical work / marketing / financial evaluation</td>
</tr>
<tr>
<td>4</td>
<td>Associate Director of Corp. Banking</td>
<td>Banking, MBA</td>
<td>branch banking / corporate banking / customer relationship</td>
</tr>
<tr>
<td>4</td>
<td>Associate Director, Knowledge Management, Corp. Banking</td>
<td>Banking, then IT</td>
<td>Banking IT manager, IT systems / KM</td>
</tr>
<tr>
<td>8</td>
<td>E-commerce Development</td>
<td>Marketing, MSc in Business</td>
<td>e-commerce marketing analyst / business analyst</td>
</tr>
<tr>
<td>11</td>
<td>Internet Sales</td>
<td>Chemical Engineering / Schoolteacher</td>
<td>Training, HRM, Internet Sales</td>
</tr>
<tr>
<td>6</td>
<td>Store Marketing Manager</td>
<td>Marketing</td>
<td>Supermarket marketing, financial product marketing</td>
</tr>
<tr>
<td>6</td>
<td>Credit &amp; Risk</td>
<td>Electronic Engineer, MBA</td>
<td>Finance, Credit scoring, fraud prevention, Risk mgmt</td>
</tr>
<tr>
<td>7</td>
<td>Business Analyst</td>
<td>Business Studies, MBA</td>
<td>e-business strategy / tech strategy / tech evaluation</td>
</tr>
<tr>
<td>3</td>
<td>Head of Retention (British Gas) / Finance Director (Goldfish)</td>
<td>Finance - Consultant</td>
<td>FD in British Gas Fin Services</td>
</tr>
<tr>
<td>3</td>
<td>Manager of IT Finance</td>
<td>Finance</td>
<td>Finance roles throughout</td>
</tr>
<tr>
<td>9</td>
<td>Retail Strategy Manager</td>
<td>Mechanical Engineer - corporate mgmt training, MBA</td>
<td>consulting, change management, Strategy</td>
</tr>
<tr>
<td>1</td>
<td>Investment Banker</td>
<td>Banking</td>
<td>Investment Banking</td>
</tr>
<tr>
<td>12</td>
<td>Technology Director</td>
<td>Mathematics, Operational Research</td>
<td>Mathematical modeling, OR in brewing industry, derivatives, trading systems</td>
</tr>
</tbody>
</table>

Table 3.1: Interviewees' current and past organisational positions and their educational / professional backgrounds.
As suggested in Fig. 3.1, interviews have been re-designed and adapted at different stages. That was done frequently throughout the 30 total interviews, primarily for three reasons: each interview has been adjusted with regard to the interviewee’s expertise; each new interview was informed by a detailed study of information that was obtained from previous ones; and in each interview, the familiarity with the subject was increased and interviewing skills improved, allowing for techniques to be used more effectively. Table 3.1 above reports organisational roles, professional backgrounds and past positions of interviewees; this illustrates the diversity that necessitated interview adjustments to different expertises. The table reports in column 1 the company codes. The corresponding company names can be located in Table A.1, Appendix A. The evolution from early interview structures to later, more mature ones started with a set of introductory interviews that – together with desk research – led to a clearer understanding of the research setting. That, in turn, informed a first re-iteration of the research questions towards more focused and addressable forms. Later interviews provided more accurate understanding of what interviewees considered the pertinent issues in TIDM to be; at that stage, the initial research questions were abandoned altogether, as the investigation was driven by newer empirical evidence.

**Analysis of Interview Data**

Analysing the interview data involved considerable effort in defining and readjusting the research objectives. Initial research questions assumed the role of the starting framework that was later shaped in light of new interview data as the investigation field became clearer. Because higher level analysis was performed after each interview, improvements in the analytical framework followed the four-step iteration depicted in Fig. 3.1. This evolutionary process is reflected in Kolb’s (1986) research on learning cycles, comprising a sequence of (1) concrete experience, (2) reflective observation, (3) abstract conceptualisation and (4) active experimentation.

The wider approach and specific tools for interview analysis are consistent with the Grounded Theoretical approach the research adopts. The sequence of actions followed is the one suggested by Easterby – Smith et al (1996: 108 - 112). This consists of seven discrete steps and is briefly represented in Table 3.2.

Applying this procedure led to the gradual identification of a large number of interest areas or themes that were indexed in a repertory grid (or matrix) as the horizontal dimension, with the vertical dimension referring to all the interviews. Because of the semi-structured nature of the interviews, such themes were inevitably addressed under different terms, depending on the context of the discussion. These were later recoded (as suggested in stage 5 in Table 3.2) to reflect more closely specified issues that were developed towards
the closure stage. In that process, some of the identified areas were found to have local only character and reduced importance to the TIDM subject and were therefore finally omitted. Ultimately a set of six wider themes were found to encapsulate the subject in adequate detail. These are discussed in detail in Chapter 7.

<table>
<thead>
<tr>
<th>STAGE</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Familiarisation</td>
<td>Re-reading the transcripts; draw on recorded and unrecorded information; listen to recording; draw first ideas.</td>
</tr>
<tr>
<td>2. Reflection</td>
<td>Critical evaluation of what was done; attempt to identify how the data inform existing knowledge; draw on previous research; reformulate and test ideas.</td>
</tr>
<tr>
<td>3. Conceptualisation</td>
<td>Identification of important explanatory concepts and variables; locating these into transcripts; possible identification of more concepts in transcripts.</td>
</tr>
<tr>
<td>5. Recoding</td>
<td>Putting the concepts in respondents' context; identifying different meanings; further interpretation; adjust number and detail of concepts if needed; expand or collapse concepts (laddering).</td>
</tr>
<tr>
<td>6. Linking</td>
<td>Link variables into more holistic theory and literature; develop draft of analysis results and communicate it.</td>
</tr>
<tr>
<td>7. Re-evaluation</td>
<td>Identify possibly omitted or over-emphasised factors; identify contradictions; take criticisms onboard; reiterate until satisfactory.</td>
</tr>
</tbody>
</table>

Table 3.2: The seven stages of semi-structured interview analysis (adapted from Easterby – Smith et al., (1996): 108 – 112)

The selection of technical tools for the practical implementation of both interviewing and the analysis played a key role in both improving the pace of data collection and achieving effective interpretation of the interviews. On that account, use of different types of recording equipment, sound processing technologies and coding techniques for the data was made. The details are provided in Appendix A.1.

Summary and Conclusions: Contextualising Data

This chapter discussed the research methods of this work. It began from a general account of the relationship between theory and data and explained the argument for using a method based on semi-structured interviews and other secondary data. A choice was made on three considerations: the epistemological merits of phenomenology, the nature of the investigated problem, and the choice of the Actor-based IGT as a theoretical basis. The rationale was argued on the observation that the TIDM problem is resulting from the social construction of reality rather than any form of normative assessment, and thus should be looked at through qualitative means. More specifically, the semi-structured interview is favoured because it manages to accommodate the Actor-based IGT and addresses the totality of viewpoints in a way that other observational techniques fail to. The method is discussed in the empirical context of this research to assess its applicability and, ultimately, the practical considerations stemming from its implementation are critically examined.
The implications of the methodological choices described above are summarised in the following points. First, the decision to use a Case Study approach in the particular form of firm-centred and expertise-specific investigations follows the choice – as proposed by the theoretical framework– that the study focuses on Actors’ perceptions on TIDM rather than drawing on implementation particularities. The method therefore follows the research objectives. Second, quantitative data are used, where applicable, as a supplementary source, taking into account the observation that they are inherently informed by the perceptions, assumptions and interests of the Actors who own and disclose them. Third, the chosen semi-structured interviewing research technique is consistent with the wider Grounded-Theoretical approach that the Actor-based IGT comes with. It is also sufficiently detailed to provide the required depth and detail, and therefore use of more elaborate methods, such as participant observation is unnecessary. Finally, the ultimate form of the total research design is contingent to the nature of the investigated problem. This is considered normal in the grounded theory context: as with all types of exploratory research, the research process in this thesis is understood as the research moves from one stage to the next.

Following the clarification of research methods, the next goal is to provide context for the whole empirical investigation. This is done in Chapters 4 and 5 through a review of the history of the UK banking sector and an account of the technological advances that marked its transformation in the 1990s. This account will then provide the foundations for addressing the problem of technological investments and their appraisal within Internet Banking projects.
PART 2

Chapter 4: Retail Banking & Technology in the UK: Historical patterns of TIDM and Expertise

Introduction

The discussion of research method in Chapter 3 concluded the first part of this work, in which the rationale for this thesis was described and the nature and characteristics of the investigated problem was discussed. It then developed a framework for its theoretical treatment before addressing the issue of empirical research and choosing the methodology for dealing with it. The first part of this thesis also proposed that TIDM is a socially constructed problem that can only be addressed in its current context by taking account of the views of Actor groups which have addressed it in the past. These groups participate in direct or indirect ways in a series of negotiations whereby the reality of what TIDM is and what is the right way for doing it is dynamically decided. They 'populate' different and often diverse locations in the social and economic space from which their relationship to TIDM is influenced, and the very nature and expression of TIDM as a problem is largely defined by where those locations are.

Dealing with this social and economic environment is the task of this part of the thesis. This task is divided into two: to examine historical aspects of banking technology and assess their importance in defining TIDM patterns in different eras; and to provide a detailed account of the UK Internet Banking environment and introduce the firms discussed in this
thesis. The result will be a view of the landscape — geographical, economic, social and political — in which TIDM is generated and developed as a problem.

Specifically, this chapter is largely preoccupied with the 20th century history of technology in UK banking. Markedly, the choice to discuss British banking for that extended period is justified by certain historical developments. First, the different roles that technology assumed at different historical instances, shaped the understanding in the sector of what technology can deliver for banks and, thus, altered the perception of what aspects of it should be measured to assess its capabilities. That greatly influenced TIDM perceptions through time and gradually led to the understanding that is currently established. Second, instances of technological change in UK banking were often marked by respective changes in the banking labour structure and, most important, in the structure of expertise residing with the bank. It is the argument of this chapter that this expertise change also played a significant role in defining what TIDM is and how it should be done, at different eras. It is, finally, the leading technological advances of the 1990s in the sector that caused significant changes to the nature and characteristics of banking activity in the UK. It is on the basis of these technological changes that Internet retail banking developed and gathered momentum.

The chapter is divided into two parts. The first provides an account of the most important technological developments in the sector. Doing this offers a broad view of the environment within which TIDM was addressed in different historical periods. The second part addresses the relationship between technological developments in UK financial services, on the one hand, and TIDM and expertise, on the other. It addresses the historical evolution of banking technologies in the light of a mutual shaping of technology and organisation as this was observed in the case of UK banking. By focusing on this framework of mutual influence the chapter then examines the changes in expertise and formal structure of UK banks and relates them to the changing role of technology in banks' activities. In turn, it is suggested that there is a strong relationship between how expert groups and their political interrelations develop as outcomes of technological development, and the ways that technological decisions are being made by these expert groups.

This chapter develops in a spiral that allows the discussion to evolve from the generic accounts of banking technology to the more specific ones of TIDM patterns and expertise. It starts from a generic historical account on UK banking technology developments. In turn, that discussion is focused on the evolution of banking expertise that accompanied technological and other socio-economic occurrences. It finally zooms-into the core subject of how historical patterns of TIDM in UK banking developed in conjunction with the respective patterns of expertise and other social, political and economic conditions.
The Nature and History of Retail Banking in the UK: The Role of Technology

This first part of the chapter provides a short history of banking technology. It discusses historical events in their socio-political and economic context and provides a track of technological progress in UK banks. The aim is to contextualise banking activity and illustrate that this context is inevitably technology-laden.

The term 'banking' refers to that professional activity related to the management of financial resources of third parties (organisations or individuals), and the provision of borrowing and saving facilities to them, usually for a fee (Crane et al., 1995). Banking assumes an intermediating role that also involves the management of borrowing or lending, the guaranteeing of funds and the management of economic risks. Fincham et al. (1994: 27) describe the quadruple role of financial intermediation at large, which naturally applies to banks as well as other types of financial institutions: (1) maturity transformation, (2) risk pooling, (3) aggregate savings and (4) reduction in transaction costs.

Banking has been a feature of European economic life since the Middle Ages, when the need for regulated and controlled management of pecuniary resources was first seen as pertinent to the state's well being (Galbraith, 1987). Since then, banking has been subject to numerous regulations and deregulations in Western countries, while it has totally changed both in shape and function since its initial inception as a professional activity. The most radical transformation of the banking sector came in the second half of the 20th Century, as post-War Europe established new economic relations with its transatlantic allies. In particular, four events during that period had a profound impact on the banking sector: (1) The recognition of the need for internationalisation of banking exchange as a necessity for the development of global trade; (2) a series of banking Acts that established international rules of monetary exchanges in trade; (3) the subsequent development of standards to facilitate banking exchange; and (4) the technological innovations which led to the dematerialisation of banking transactions. These events led, during the late 1980s and throughout the 1990s, to a period of unprecedented change in the practice and functional attributes of European banking.

The natural fit of Banking and Innovation

Technological innovations in banking activity have always had a determining role in the shape of the industry. Most of the major changes in contemporary banking have, in one way or another, been accompanied by technological changes. Banking is by its nature suited to innovation and, consequently, to technological applications. Innovation, whether product
or process related, is inherently linked to technology to the point that very rarely can these two exist in separation. That innovative nature of banking is addressed in the next few paragraphs, followed by a short historical overview of the computerisation of UK financial services.

The natural relation of banking and innovation suggested in the previous paragraph lies on observations of four key areas: (1) the nature of relationship management in the banking business; (2) the effects of state intervention; (3) the banks’ direct access to capital; and (4) the nature of the banking business organisation. These are briefly addressed here.

The very essence of banking lies in the management of the banks’ relationships with depositors and investors on the one hand, and the recipients of the banks’ investment, on the other. Engineering that particular relation to beneficial ends is by definition an innovative process: recruiting and retaining customers whilst maintaining profitable investment often involves tailoring both the customer and investment portfolio to each economic cycle, market segment or strategic paradigm. Furthermore, risk pooling - one of the primary banking activities – demands systematisation in regard to managing risk. These tasks suggest a natural position for innovation.

Secondly, given the importance of banking for state affairs and the economy, regulatory supervision has become standard practice. Historically, this has had two impacts on the innovative nature of banking: one, that following regulatory adjustments (during wars or economic downturn) banks were forced to innovate in order to survive unfavourable conditions. Two, that because of the exposure of banking to such state intervention (or indeed reduced involvement through deregulation), banks had to become more proactive in terms of their technological flexibility and develop capabilities for identifying and avoiding any ill effects from new regulations

Thirdly, the dynamic and innovative nature of banking has further been facilitated by capital availability: Technological applications for banking have, for the best part of modern banking history, been capital intensive, primarily because of their inherently large scale and dedicated design. Furthermore, banking has historically been a pioneering area for new-scope applications of established as well as novel technologies. Capital availability has hence played an important role in technological investment, with banks bearing a significant advantage over industrial firms: direct access to capital. Being the key sources for corporate borrowing, banks enjoyed the flexibility of not having to take their investment proposals through the exhaustive appraisal processes that they themselves were imposing on their clients for lending approval. That flexibility implied reduced transaction costs in banks’

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1 A suitable illustration of this effect is that of information transmission security and data encoding imposed by regulatory bodies.
2 Large scale and dedicated design featured from the 1920s onwards where banking had become a major application field for computing equipment. Detailed accounts on this subject are provided by Cortada (1993) and Batiz & Boyns (2003).
internal investment in technology. Economic justification of technologies has, by definition, become an internal decision, often seen as similar to any decision for infrastructure acquisition - such as, for instance, branch opening.

Finally, large customer scale and the modular nature of banking business have historically been good reasons for encouraging mass treatment, maintenance and presentation of customer data, which offer fertile ground for technological applications: growth has traditionally been accompanied by the need for machines to perform repetitive accounting operations or other processes. The organisation of banking activity has traditionally relied on the unit of the 'account' as the basic element of a uniform business structure, and despite having gone through significant changes, it remains the basic functional unit of retail banking services. Organisation by accounts has traditionally been a convenient way for sorting activities, achieving ordered processing of transactions and maintaining aggregate control over the total business. Accounts became the main measuring and monitoring entity for retail banks that use 'account activity', 'transactions per account' or 'accounts per customer' as measures of performance or efficiency. The notion of the account increased in importance with the leap increases in customer numbers that followed the two World Wars. Combined with the effect of branch opening in cities where UK banks were not previously established, customer knowledge that came from personal acquaintance diminished. Similarly, such expansionary effects also reduced the significance of a reputation-based relationship. Banks were no longer able to assess an individual or business customer by his prior record in accommodating their financial obligations, which totally altered the perception of risk.

**The History of UK Banking Technology**

A history of banking technology must be carried out with reference to its wider context that includes economic, regulatory, political and other industry-specific dimensions. Only in this way can one appreciate the full role of banking technology and, in turn, recognise the evolution of TIDM practice. This type of historical account for banking technologies is provided in the next few paragraphs.

The first uses of communication technology in banking are recorded as early as 1846 in the U.S., with the application of telegraph messaging (Garbade & Silber, 1978, p. 823). Despite the expansion of such applications from New York to London, with the installation of transatlantic cables in 1866, this innovation had little impact on the way that commercial banking was performed in the UK (Batiz-Lazo & Wood, 2002, p. 6). The history of banking technology in the UK therefore mirrors that of the computerisation of financial

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³ It is worth noting that the 'customer' as the basic unit of transaction and banking business is a very recently introduction in modern UK banks. Possibly, this peculiarity is due to both the established account base and the technologies used to accommodate it.
institutions. That is because no other class of technologies has produced a noticeable impact in the industry, probably because of the service nature of banking that relied on accuracy, consistency, reliability and sophistication - features that computer technology was introduced in all business areas to accommodate.

The use of accounting machines, as they became known at the beginning of the 20th century, signalled the start of the mechanisation of banking. These machines, such as Felt & Tarrant's Comptometer and Burroughs's calculator, were from the 1890s (Cortada, 1993, pp. 39-41) used in banking as desktop adding machines. In the late 19th century, banking applications were merely general purpose uses of desktop adding machines. The then current understanding of the nature of banking business reflected the view that technologies should be applied with the aim of achieving speedier and less error-prone performance of clerical tasks. For this reason, such engines were viewed before the 1920s as standalone applications, rather than as parts of a system (Cortada, pp.3, 44). Even with the prevalence of limited liability banking, a regulatory requirement that later led to the development of nationwide branch networks (Batiz-Lazo & Wood, 2002, p. 7), branches remained technologically isolated units, rather than under central control from the headquarters.

The introduction of the punched card tabulating machine in the 1920s marked a new era for banking technologies. Three reasons contributed to that: First the use in banking of dedicated equipment like the Hollerith tabulator, a massive mechanical device that had been around since the 1880s, had been the first application of systems-based technology (Cortada, 1993, p.44). Established perceptions about banking were that the branch-based business could only be technologically facilitated through improvements in the accounting function: this was largely a task of the massive application of calculators for speeding up and offering accuracy in clerical tasks. Such office configurations, though, were not developed in a systems rationale, but were mere ordered aggregations of identical office equipment. Second, banking applications for tabulating machines marked the first sign of the industry's perception of its data processing intensity and the subsequent potential for technological applications aiming at cost reduction. That had largely gone unnoticed for the 30 years that tabulating machines existed. Technological inventions were, until the 1920s, clearly geared to supporting the accounting function (Cortada, 1993, p.51). That is also evident from looking at the spectrum of applications of tabulating machines that ranged from census tables and sales statistics to billing in the railway business and cost accounting in insurance. Third, tabulating machines were by the 1910s already viewed as less skill-demanding devices, and

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4 The literature on the history of computing suggests that this type of accuracy-driven purpose of early computers was the perceived paradigm for the industry of adding and calculating machines. That was one of better machines for manipulating numbers and the need to handle large quantities of figures (Cortada, 1996, p. 14).

5 Cortada (ibid, p.45) observed that the data processing industry, where tabulating machines were developed, was of relevantly minor business significance before the 1920s. It was the identification of the mass-processing capacities of tabulating machines that made firms realise that business potential.
hence had raised controversy amongst accounting professionals who saw them as a threat to their expertise. In turn, that aspect of tabulating technology further fuelled the gender-based division of labour in UK banks, where unskilled female staff were largely recruited to operate tabulators (Booth, 2004).

The witnessed gradual adoption and adaptation of tabulating machines in banking is explained by a number of factors and events: the deteriorating economic conditions, the increased scope of banking business, the emergence of several service innovations in the industry, the realisation of the urgent need for cheque-processing costs are some such factors. Tabulating machines, notably, were transformed until the mid-50s from single-function engines to unified systems comprising data entry, sorting and other management functionality. (Cortada, 1996, p. 45)

Simultaneously, developments in the data processing industry made the technology more usable by standardising several functions into failsafe protected processes. That further contributed - in conjunction with pressures for lowering labour costs - to a rise of employment of unskilled women as bank clerks. As indicated by the Midland case study (Booth, 2004, p. 281) male employment was reduced in relative terms during a period (1939-69) where overall numbers rose significantly. As late as the 1950s, banks' traditional employment pattern remained unchallenged, with males dominating the management side, while women were recruited for clerical tasks. By 1962 more women were leaving banks for more attractive careers, causing often severe problems for bank staffing. Interestingly, the role of technology was critical in this pattern: stagnant innovations in the area of banking applications of tabulating machines and office equipment led banks to deal with higher data volumes and capacity by increasing the size of existing infrastructure. High equipment costs further justified that choice as against investing in new infrastructure. This size explosion had an economic impact on banks with regard to their abilities for cost-justification of technological investments: the need for buildings adjustment to accommodate bulky machinery often made technological investments indefensible. Because high-street property was the most valuable asset of banks by that time, limitations imposed by adaptation costs, often made many, otherwise crucial, retail outlets unsuitable for the already technology-heavy intended use.

The transition from standalone equipment to mechanical systems was furthered during the 1950s and 1960s with developments in electronic technologies, such as the commercial introduction of the computer in 1948 by IBM (Campbell-Kelly, 1989) and the development of MICR. Despite the technical superiority of electronic over mechanical processing, the rationale of systems' usage in banking largely remained unaltered:

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6 The acronym MICR stands for Magnetic Ink Character Recognition, an application first developed by the Stanford Research Institute in 1956, later used for cheque sorting and data capturing (Batziz-Lazo & Boyns, 2002, p. 14). Steiner & Teixeira, (1990, p. 33) report that early computers (such as the NCR 315/316) as well as later ones (such as IBM 360) applied MICR technology.
computers were introduced to deal with specific technical problems of volume processing effectiveness. Subsequently, the speed of transaction processing delivered by electronic equipment contributed to the success of this mass-market expansion. At that stage, electronic technologies were implemented in existing departments to deal with existing problems (Morris, 1986), rather than assuming the role of transforming business processes. One of the major banking-related computing innovations was batch processing, i.e. the sequential reading of data related to different automated activities. That enabled the fast simultaneous processing of transactions, standing orders and other internal clerical tasks (Fincham et al., 1994) to achieve scale economies.

Computer technology in banking in the UK was operationally restricted to the 'back-office' – and considered as a class of applications suited to speeding-up existing tasks and providing cost-savings on labour. The extreme cost of that equipment further contributed to the perception that computer technology could only be economically viable in centralised massive processing tasks. Changes that were occurring in other dimensions of banking business were more visible and exciting. First, the newly introduced hardware called for specialised programming skills, which triggered a shift towards banks developing in-house solutions and the expertise that came with them (Fincham et al., 1994, p. 153). That trend, combined with the lack of universal programming languages in the early years of computerisation imposed significant costs on implementing banks in recruitment and training, whilst reusability of the skills was very low across different hardware platforms. Second, the local-only character of early computer technologies had a significant impact on upgrading the strategic role of the branch: driven by increased technical capability, branches - the main points of customer service – gained flexibility as computers enabled them to perform tasks previously performed by the bank’s headquarters only. This upgrade necessarily came hand-in-hand with increased power of branch managers, thus reinforcing a status established in the 1920s.

The period between 1965 and 1969 saw the introduction of EDP (Electronic Data Processing systems) and DBMS (Database Management Systems) in UK banks, triggering a series of important changes. First, on the operational side, EDP and DBMS promised integration and accumulation of existing customer and other data, with a view to consolidating disparate and otherwise unused bits of information, centralising their control and, ultimately, distributing it selectively where it was needed. Again, the rationale for such expensive systems remained focused on the high volume and complexity of existing customer data (Batiz-Lazo & Wood, 2002). Second, on the organisational side, DBMS applications in particular allowed the centralisation of information handling and the resulting redistribution of responsibilities and, therefore, of power: given the established branch-based structure, the shift from regional to central control of sensitive customer information resulted in a loss of control from existing hierarchies. Finally, on the technological side EDP and
DBMS were the first steps in the development of intra-bank networks (as opposed to the technological ‘culture’ of standalone equipment that prevailed in banking up to then) and the foundation of Integrated Banking Technology Standards (Consoli, 2005). Notably, the prevalence of database-driven design rationales for banking systems gave precedence to new perceptions of the economics of networks and important new applications that shaped the global banking industry. However, the EDP / DBMS era was characterised by the persistence of a culture of isolated (as opposed to integrated) technological efficiency targeting, economic justification of technology on the basis of labour cost minimisation, and a view of technology as a means for automating existing processes. Despite the improved labour cost structures that were introduced because of the increased computing power of banks, the economic justification of technologies remained cost-saving in the head office, with minor and expensive branch efficiency improvements and other potential technological gains sought at local level only.

High degrees of diffusion of DBMS applications nearly coincided with the growth of another major banking technology: Automated Teller Machines (ATMs). Following developments in MICR technology and the launch of the first credit card in the UK by Barclays in 1966, ATMs were first introduced in the British market by the same bank two years later, primarily to exploit the extreme popularity of cash withdrawals from credit card accounts (Ackrill & Hannah, 2001, p. 187). Although they were characterised by heavy investment and extremely demanding infrastructure and maintenance needs, ATMs turned out to be a ‘killer’ application. Figures 4.1 and 4.2 demonstrate the recent growing presence of ATMs in the UK. The economic justification for them was primarily advocated on the basis of labour savings and the savings from not having to acquire premises for branch expansion for cashier positions (Ackrill & Hannah, 2001, p. 338). Despite their ubiquity by the late 1980s, ATMs were, however, not always seen as a clearly profitable investment, since their financial appraisal was difficult: the ambiguity in the way that cost improvements were calculated primarily stemmed from the fact that ATM prevalence caused an increase in the number of transactions, which made financial calculations difficult (Steiner & Teixeira, 1992, p. 93). However, the development of network technologies that detached ATMs from branches had significant impact, not only to the spread of such machines but also to the shift in focus of banks’ investments from acquiring new branches (a necessary investment to expand their ATM network) to achieving technology efficiency.

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7 The literature refers to a number of initiatives based on early DBMS technologies, such as BACS and Girobank (Batiz-Lazo & Wood, 2002) and other applications relevant to the automation of the UK Clearing System and retail money transfer. See Fincham et al. (1994), Morris (1986), Mandell (1990) and Consoli (2005) for more detailed accounts.

8 The first ATM application was operated with a paper voucher that was issued by the bank as a £10 token, later to be replaced by plastic punched cards and later by magnetic stripe cards (Consoli, 2005).
Figure 4.1: Number of ATMs in England, Scotland and Wales (1996 – 2000). Source: Reuters Business Insight.

Figure 4.2: ATM numbers by location and population (1998 - 2002). Source: Datamonitor.

The period from the late 1960s until the 1980s has been characterised as one of high penetration of hardware and software technology in banking, with banks emerging as key customers of the computing industry with ATMs and EDI (Electronic Data Interchange)
systems prevailing in banking data processing (Fincham et al., 1994). Advances such as the development of Euromarkets – primarily driven by new technological capabilities and with the contribution of other socio-economic factors – brought London to the centre of international banking and altered the recruitment patterns of the industry (Morris, 1986). Full automation of branch operations and the accompanying shift of technological focus from processing to communications and MIS (Management Information Systems) were some of the key events of this period. The newly instilled culture of EDP and DBMS gradually led to the establishment of networking as the primary technological characteristic of UK banking, with IT permeating the customer-bank interface. Strategic aims were focused on effective service provision rather than expanding the customer base, or even creating customer value.

The 15 years following the close of the 70s were marked by great technological changes, namely the emergence of the personal computer (PC), developments in digital data telecommunications (Fincham et al., 1994, p. 155) and advances in programming such as RDBMS (Relational Database Management Systems) and Object-oriented Programming (OOP). Termed the era of 'Information Revolution in Financial Services' (Batiz-Lazo & Wood, 2002), this period saw an unprecedented demand for secure transmission of financial information related to large volumes of mainly international payments. Furthermore, events such as the Lending Crisis (1978-82) contributed to the so-called institutionalisation of banks: retail banking broadly ceased being a professional activity relying on the more personal branch manager relationship with customer and shifted towards a more hierarchical institutional manager-driven business (Morris, 1986). On the technological front the key impacts of new developments were the higher standardisation of processes, the lowering of entry barriers to the industry through diminishing prices of equipment and the shift of technology strategies from efficient performance of tasks to full integration of systems and information. Much of that change can well be attributed to the introduction of the PC, the new standalone, portable, flexible programmable device with networking capabilities. Its benefits ranged from location-independence to flexibility in training needs because of the PC's universal programming ability. Together with the introduction of relational databases (RDBMS) the adoption of the PC altered the patterns of employment in the industry: with RDBMS hugely quickening the pace of training (Consoli, 2005) and computer skills being less industry-depended, cross-industry migration of IT skills became easier, more standard and cheaper. The aggregate effects on the industry obviously benefited bank customers, as the strategic trend returned to consumer-oriented innovations. That shift may well be attributed to better integration through IT, more complete standardisation of processes with the aid of improved communication and IT standards, and, ultimately, a rather saturated retail market. Thus banks returned to seeking competitive advantage from differentiating on the product offerings and quality of service, rather than on time and cost-efficient processing through IT.
The period from 1980 until 1995 was, on aggregate, one of major – though more subtle – changes for UK banking, mostly driven by technology. With information acquiring a key role in financial transactions, many technological applications aimed at improving quality, security and speed of financial information. On the front of customer-facing technologies, the ability to detach ATMs from branches and the institutionalisation of banks totally altered the significance and role of the branch, from a traditional point-of-sale (PoS) one to a more service and marketing-centred role. This pattern was closely followed and stably augmented in later years. Together with other economic incentives, that technological ability contributed to the reduction of branch numbers.

The latest stream of developments in the history of banking technology in the UK is attributed to two major events that signalled the furthering of alternative channels use in retail banking services. One was the introduction of call centres, the forerunner of contemporary integrated CRM\(^9\) and telephone banking systems and the other was PC banking, namely direct service provision through the customer's own computer. Both applications introduced the notion of Home Banking and, with it, a novel perception on service provision and disintermediation of branch-based banking. These applications came to the fore at the same time as a number of developments related to general computing and the all-expanding networking technologies. With an economic and social environment that was receptive to new technological initiatives, the years 1985 to 1990 saw unprecedented growth in the hardware and software industries, especially following the diffusion of the IBM-compatible PC. The resulting spillover of generic programming skills to the home user and at the individual level appears to have played a role in the familiarisation of employees with computer technologies. At the same time, while all industries invested heavily in computer technology, mainly to support the customer service end, the migration of both software applications and expertise became easier and more transparent. Developments in software techniques (such as Object-Oriented Programming) made application development a more uniform and standardised task, reducing the need for specialisation. The new definition of programming as designing processes by interfacing between reusable objects, in turn, reflected a wider business rationale: re-engineering business operations through process redesign.

Overall, since the early 1990s innumerable IT applications permeated UK banking organisations. Diminishing costs of technological infrastructure and standardisation have facilitated the innovation-laden, dynamic environment that followed the 'Big Bang' of the British financial sector. Key technological feats which allowed these developments include development of high-speed data communications, database integration, the emergence of the Internet and security technologies and the legislative and regulatory impacts that they

\(^9\) Customer Relationship Management systems.
had. The emergence of applications on CRM, e-commerce, smart cards, EFTPOS and, most important, Internet Banking can largely be attributed to these broader instances. Interestingly, as happens in most instances of technological progress, technical barriers in banking technology have often been overcome long before the relevant technical solutions were implemented. Such were the cases of ATM connectivity (fully achieved in 1999 in the UK) and the development of small payments clearing mechanisms. The full potential of technological capability is, historically, only exploited when ample economic benefit can be reaped from interested parties.

At this stage, the broad historical account of banking technology is concluded. The discussion now focuses on analysis of the context and meaning of these significant events in UK banking technology history, which will serve as a guide to understanding the essence of technological investment decision-making. This is because, I believe, technological decision making is an inherently historical activity, and that historicity is revealed through locating, among events, patterns of human or group behaviour, perceptions of reality, techno-economic conditions, power relations and organisational structures that dictate patterns of decision-making and that occur in a repeated, or even cyclical, manner. A discussion on these aspects will be provided in the final part of this chapter.

Technology and Expertise: Antecedents to Technological Investment Decision-Making and the Role of Banking Expert Groups

Having addressed the overall business landscape, this section is devoted to the professional and economic sides of banking technology assessment. It contends that the appraisal of technological investments and TIDM at large, greatly relies on the development and establishment of expert groups in banking. These evolve either within the banking industry, namely in the world of practitioners, or outside it but still within areas that are very relevant to it, namely in the world of observers. There is therefore a direct relevance between the pattern of expertise development in UK banking and the pattern of TIDM practices as these can be historically observed.

The approach is based on the historical account provided earlier, with a new focus on locating instances, patterns and cycles in the evolution of UK banking technologies that link expertise development to established perceptions on technological value.

In order to systematise the account, use is made of familiar taxonomies of the history of banking technology. Such taxonomies are provided by a number of scholars
(Morris, 1986; Batiz & Wood, 1997; Consoli, 2005) and are broadly based on major technological innovations in the sector and consequent changes in banking business. A summary of two such historical categorisations is provided in Table 4.4.

Table 4.1: Periods of banking history according to Morris (1986) & Consoli (2005)

<table>
<thead>
<tr>
<th>Years</th>
<th>PERIOD (Morris)</th>
<th>PHASE (Consoli)</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1864 – 1945</td>
<td>Early Adoption</td>
<td>Electric to Electronic communications</td>
<td>Reduce inter-market price differentials Increase coordination between Head Office and branches</td>
</tr>
<tr>
<td>1945 – 1968</td>
<td>Specific Application</td>
<td>Processors to Databases</td>
<td>Conversion from branch to bank relationships Automated bank statements Cheque Guarantee Cards Reduce cost of labour-intensive processes</td>
</tr>
<tr>
<td>1968 – 1980</td>
<td>Emergence</td>
<td>Automated machines to local networks</td>
<td>Growth of cross-border payments ATM introduced Automation of branch accounting Real-time control begins</td>
</tr>
<tr>
<td>1981 – 1995</td>
<td>Diffusion</td>
<td>Standardisation vs. customisation</td>
<td>Supply of non-payment products like insurance, mortgages and pensions Growth of alternative distribution channels (phone, EFTPOS)</td>
</tr>
<tr>
<td>1995 - now</td>
<td>Generic (Open Platform) Application</td>
<td>Internet gains momentum in business applications Object oriented programming &amp; visual languages Integration of banking across all levels (STP) Convergence of ICTs &amp; computing CRM</td>
<td></td>
</tr>
</tbody>
</table>

Instead of simply following the taxonomies as compartmentalised pieces of history, this section will look across them and identify instances or patterns by which banks have addressed technologies with respect to their economic viability, their potential benefits and, overall, their perceived value. This will allow an investigation of the linkage between, on the one hand, the roles of technology in banking and the technology's practical treatments and, on the other, the respective roles of established expert groups. The intent is to establish that there exists a close relationship between the expertise backgrounds of key decision makers and the established attitudes of the organisation towards technological appraisal.

This is part of a wider contention that patterns of expertise in any industry are part of the broader business paradigm that dictates the background of decision-makers, sustains their dominance, adheres to their understanding of reality and rewards actions that are considered rational under this paradigm. This framework, ultimately, informs the formal and practical approaches to valuation of any aspect of business, technology being one of them. This framework is driven by the political organisation of knowledge introduced in chapter 2 and, from there, suggests that normative definitions of TIDM are only contingent to the Actors who participate in it. Expertise is seen as one of the key intellectual features of these Actors and, hence, it is given great importance in this discussion. Along these lines, this section seeks the sources and rationale of TIDM, to conclude that attitudes to technologies are determined by the established viewpoints of dominant expert groups. TIDM rationale and
practice therefore becomes, it is proposed, a question of expertise dominance in respective eras, marking different paradigms of investment appraisal.

This section addresses expertise and TIDM perceptions in two parts. The first discusses the evolution of expertise by looking at historical periods of UK banking technology. In the second, discussion is focused on locating and analysing aggregate attitudes of financial institutions to technological investments. The final paragraphs of the section draw connections between expertise and investment valuation of technologies.

Patterns of UK Banking Expertise

The nature of expertise in banking has traditionally been dictated by the professional background of practitioners who performed it. As such, investigating banking expertise in historical terms requires that we begin with the professional groups which pioneered banking and the trajectories they followed through time. Early banking in the UK was practised by London goldsmiths, a class of professionals enjoying high social esteem, financial wealth and political clout. Being a profession characterised by trust, confidentiality and reliability, the goldsmith expert group was a natural fit with the nature of the business it was pioneering.

The history of banking from the 1600s until the late 1800s shows that banking demanded a combination of skills for mathematical precision, administration, legal knowledge and business negotiation. Later, the high relevance of banking to the state's affairs added political persuasion to the composition of banking expertise. At the stage where historians of technology address banking as an application field, the British banking sector constituted primarily professionals with backgrounds in Accounting and Economics. Both these expert groups were strongly underpinned by well-established academic traditions.

1864 can be seen as the beginning of the first period of banking technology history, identified by Morris (1986) as the Early Adoption era. This era saw the introduction of accounting machines and tabulators, used to perform faster and more accurate day-to-day clerical tasks. Such tasks were relevant to paper cheque handling, ledger keeping or issuing and handling letter correspondence between branches and the Head Office or customers (Morris, 1986, p.44). One of the main characteristics of this period was the division between managerial and clerical labour in banks, with managerial roles involving individuals whose position was due to their high educational, political and financial status. On the other hand, bank clerks in the early 20th Century constituted an initially unskilled labour force that

**10** Contrary to popular belief, this disciplinary background was relevant to mathematics only in the case of accounting. Economics were largely non-quantitative until the beginning of the 20th century. The mathematisation of Economics is attributed to Walras, while the first scientist trained in rigorous mathematics to pursue a career in Economics was reportedly Irvine Fischer (Backhouse, 2002, p.170, 198).
received formal training in specialised clerical posts in the bank, most often maintained as lifetime jobs.

The nature of this on-site skill acquisition culture was reinforced with the replacement of the traditionally male clerical labour force during WWI (and later WWII) with young women due to men’s involvement in active military service (Ackrill & Hannah, 2001, p. 77). During the inter-war years, the pattern of recruitment was to demarcate managerial from routine job specifications at one level and temporary from permanent at another. The introduction of accounting machines in UK banks, in 1914, had an impact on banks’ clerical staff numbers as late as the end of 1920s, when London banks replaced multiple ledger functions, typically operated by large numbers of clerks, with clusters of such engines, operated primarily by women typists. Accounting machines were introduced to improve the performance of managerial staff (Batiz-Lazo & Wood, 1998); however, their introduction also had a slowly evolving impact on the nature of clerical tasks by requiring skills in typing and operating mechanical devices. By the late 1930s trained bank clerks, typically part of the permanent staff, came to be seen as valuable workforce and remunerated generously, since much time and effort was invested in their training. After the early 1930s, a large number of the perceived efficiency problems were addressed with technology, which turned most banks’ management attention to the discontinuity between managerial and clerical staff (Ackrill & Hannah, 2001, p.79) and led to pioneering efforts for promoting permanent staff members to higher positions. That pattern, however, was not visible before the close of the era of Early Adoption in 1945.

In the following period, which Morris calls the Specific Application period (1946 – 1967), the characteristics of banking expertise begin to shape into a more profession-related set. With advances such as the introduction of electronic equipment and the maturing and post-war expansion of existing technologies across branch networks, there were two main changes to the nature of the business: One, the role of the branch network changed, from its previous limited one of customer recruitment and relationship management, to one where more of the previously headquarters-based technical tasks could be addressed at local level (Batiz-Lazo & Wood, 1008). Two, programmable automation pioneered internal skill development by enabling banks to pursue local solutions to technological infrastructure issues. These two events had a significant impact on the composition of the labour force. On the one hand, the post war surge in business volumes11 led to mass recruitment that expanded the clerical base of banks. On the other, the new technological capabilities, and technical developments such as batch processing, EDP and, later, DBMS, created an increasing need for expertise development in software design, programming and

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11 This was primarily driven by the increase in the proportion of middle-income individuals, a market that was newly addressed by UK banks after WWII (Collins, 1988). Mass recruitment was, however, also boosted by the post-war UK government demands from banks for maintaining a high and stable level of employment (Ackrill & Hannah, 2001, p. 115).
implementation (Fincham et al., 1994, p. 153). However, despite the development of internal technological expertise within UK banks, it was not until later on that this expertise was formalised under recognisable skill sets and job specifications. Instead, during this period, the expertise base in the UK banking industry remained firmly with professional groups who held expertise on the quantitative sides of accounting, statistics, economics and advanced mathematics, a class of experts that primarily populated the insurance industry and that had a long-established tradition with quantitative analysis tasks.

The next era was the Emergence period (1968-80) according to Morris. Driven technologically by numerous feats in communication and data processing, such as data networking, ATMs and the emergence of MIS (Management Information Systems), this period was characterised by a major expertise spillover into the financial services sector. This resulted from the ending of many military projects, primarily in the US, that in turn led to the release of large numbers of highly skilled programmers and scientists onto the labour market. This labour force was now availing itself not only to programming posts in banks but also to a market for financial managers, economic and financial forecasting specialists and other non-technological banking expert jobs. That change largely contributed to an altered perception of banking job descriptions, expressed in the UK through a shift in banks’ recruitment patterns: since technological advantage was increasingly considered a major competitive asset, highly skilled university graduates were now seeking careers in UK banks. This altered the hitherto dominant pattern of internal job markets discussed above (Batiz-Lazo & Wood, 1998, p. 13). Developments such as London’s upgraded role in international finance (with the successful implementation of Euromarkets in the 1970s) and the impact of applied Management Science through the formalisation of business analysis attracted large numbers of young qualified graduates mainly with Positive Science or Economics backgrounds who now viewed banking as an attractive, high-paid, ambitious, promising and motivating sector.

The last of Morris’s identified periods (1981-95), the Diffusion period, is marked by the information revolution in financial services (Batiz-Lazo & Wood, 2002), mainly expressed through major internal integration of banks’ systems and high standardisation of IT applications with the proliferation of the PC. Further IT applications like RDBMS quickened the pace of internal skill acquisition which, in turn, meant increased organisational flexibility through reduced training cycles (Collins, 1988, p. 78). The consequence for expertise development was that existing specialisations could be cross-fertilised, giving rise to a new class of internally trained employees of diverse skills who would later assume managerial roles. The high degree of institutionalisation of UK banks contributed to explicit departmental subdivision, which brought both costs and benefits. On the upside, establishing role-specific departments was necessary for efficiently addressing the high complexity of banking activity in all fields, from risk management to technology implementation. The downside, however,
was that the high degree of specialisation isolated the speciality groups, leaving the communication between them and the integration of their knowledge and skill to higher management levels. It can be argued that this has been a source of disagreements, fierce debates and often conflicts on issues of organisation, valuation and decision-taking.

Developments since 1995 have seen the UK banking sector enter a new era, both with regard to technological applications and to expertise evolution. Following Morris’s terminology, I term this period (1995 – present) the period of Generic (or Open Platform) Application, based on the shift of technological applications onto platforms that are universally designed and then tailored to specific needs. The key such platform is the Internet. The era of Generic Application is characterised by reduced costs of incremental infrastructure building and a shift of technological implementation focus from designing dedicated systems to integrating or bundling software and hardware units over universal platforms. This changed perception of technology has influenced the composition of banking expertise in the UK. The beginning of the 1990s found UK banking institutions (which now included building societies and insurance companies after the Big Bang deregulation in 1986) under the unchallenged dominance of those expert groups that developed from the 1970s ‘new generation of City bankers’, who primarily came from Economics, Finance, Accounting or Mathematical Sciences educational backgrounds. Other expert groups that developed throughout the 1980s, such as Information Systems and IT managers were assuming only local, and at most times dispersed, influence (Fincham et al., 1994). Higher level decision-making thus remained at the exclusivity of traditional experts with technology groups playing only an advisory and largely complementary role.

Since 1995, the change in the composition of expertise in UK banking can largely be explained by the shift of focus of IT that challenged the established norms. Banking technology, as it developed during the high technological growth era of the 1980s was of an overly dedicated character in both software and hardware terms; applications were tailor-made to cover banks’ needs, often following principles that were very specific to individual institutions. This contingent expertise structure was challenged by generic applications for universal platforms that allowed easy migration of programming and wider IT expertise across industries, a pattern that was previously inconceivable. Such cross-fertilisation among industries, I propose, may be partly held responsible for the evolution of new types of professional groups, indicated by a number of IT-savvy banking experts that currently appear in Boards of Directors in UK banks (1.5, §57; 2.2, §62; 5.1, §55; 6.1, §76).

**Patterns of Technological Investment Valuation**

The account of banking expertise development that preceded is now complemented by an account of the perceptions of technological value, as these appear through UK banking history. The discussion underlines the point that expertise dominance in each era
influences the corresponding understanding of the purpose, potentials and value of implemented technologies.

Beginning with the Early Adoption era (1864 – 1945), historical evidence suggests that the introduction of accounting machines in banking was justified on the basis of speed and homogeneous, legible and properly filed record-keeping (Collins, 1988, p. 45). Because technology at that stage was introduced to deal with growing business volume, the whole justification was influenced from appraisals that were made on the use of this technology in other sectors. Early perceptions were focused on producing more output without using extra labour, rather than achieving cost savings by replacing labour (Morris, 1986; Batiz-Lazo and Boyns, 2003). This pattern, observed in the 1920s, can be linked to the fact that, traditionally, bank performance was measured in terms of business growth rather than efficiency, and only reported on request from the Board of Finance. Additionally, such measurement was only made at the branch level (Batiz-Lazo & Boyns, 2003, p.8). Interestingly, the same practice of ‘measurement by size growth’ occurred during the introduction of computers in building societies in the early 1960s (Yavitz, 1967), most probably due to the fact that growth had been the target for these institutions in that period.

Technological appraisal patterns appeared to change following the Second World War, when UK government intervention forced banks to maintain high employment levels and buy the more expensive British technology to support the local computing industry (Batiz-Lazo & Boyns, 2003, p. 10). These conditions created a driver for UK banks to emphasise cost reduction. During the 1950s and 1960s, primarily driven by established accounting practices used by equipment developers, it became common practice to measure banking technologies’ performance by the number of staff it would dispose of. By the end of the Specific Application period, the measure widely used in evaluating computer installation propositions was Payback (Yavitz, 1967, p. 46), a technique mainly inherited from US banking computer implementations. The primary driver of technological investment valuation during that period was the perception that computer applications provided economies of scale and financial benefit when used in the back-office to handle large volumes of paperwork. However, EDP and DBMS applications that were later widely used in UK banking systems modified labour costs and altered the overall cost structures of banking business.

A major change in perceptions about technological value was bound to occur during the period following the 1960s. The Emergence period (1968-80) saw the spillover of Information Technology applications across the bank and its benefits and side-effects were

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12 According to Cortada (1993) accounting machines were widely used in processing census data in the US with extremely high success.

13 Evidence suggests that equipment manufacturers played a crucial part in establishing both standards of banking equipment and approaches to evaluating the benefits arising from their introduction (Cortada, 1993; 1996).
felt in almost all departments. In that respect, there was a recognised inability of established metrics to cope with assessing or predicting the widespread impacts of computers. The examples of Management Information Systems (MIS) and many implementations of ATMs during that period underlined this gap, since many financial institutions were assessing the value of equipment on unsafe assumptions. Most importantly, the migration of IT from the back office to the bank-customer interface necessitated the introduction of estimations on customer uptake, behaviour and response to the technologies. These were aspects that were never before addressed in economic appraisal and, especially in cases of ATMs, were largely miscalculated. During both this and the next period (1981 – 95), technological investment valuation processes borrowed technical aids from other expertise groups, such as Finance, Accounting and Economics, to facilitate decision-making. These expertise areas, both within the banking profession and academic disciplines, exhibited in these years a rich production of methodologies and quantitative techniques for asset valuation that were applied to technological investments. This pattern was facilitated by the aforementioned surge of highly skilled new banking professionals in the 1970s. Despite an abundance of sophisticated techniques, however, the assumptions on which technologies were evaluated were still based on the rationale of ‘machines replacing humans’ (Batiz-Lazo & Wood, 2002, p. 18). However, developments in network technologies in conjunction with the mass-commercialisation of the PC as a generic-purpose engine totally shattered the cost structures of banking business into patterns that were hitherto unknown.

The years since 1995 – termed the Generic Application period – inherit many of the characteristics of previous eras, with the significant difference that the traditional labour savings assumptions no longer hold, mainly on the basis of experience from the introduction of call centres in the 1980s. Despite this, no clear new assumptions appear to have been formed, since precise measurement of expected benefits is becoming more complex. Furthermore there are a number of other characteristics that make technological investment valuation a complex task: First, costs and benefits of technology are not always conveniently demarcated into departments, functions or business areas. Second, the newly introduced ability for incremental building of technological infrastructure is a complex multi-parameter task for which existing valuation patterns are ineffective. Third, the long-established organisational structures of banks appear to be challenged by banking technology, an occurrence that necessitates newer approaches to technology valuation.

Although no clear-cut patterns of correspondence between expertise and perceptions on technological value can be drawn in the modern history of banking, a number of observations can potentially associate these two dimensions. To begin with, in Early Adoption years until WW2, understanding of technological value was very limited and largely based on perceptions imported into banking from technology providers, or imposed by
governmental authorities. In addition, there were few choices to be made as only a few providers existed, meaning that technological investment valuation was a rather straightforward task. In terms of the role of expertise, demand for technological valuation appeared as early as the 1920s when banks needed to assess their investment in technology firms. However, the combined technical knowledge and forecasting skills needed to accommodate such needs were almost non-existent in Britain (Ackrill and Hannah, 2001, p. 93), and no particular internal expertise appears to have dictated technological valuation until the Second War. The period following the War brought a better integration of professional skills in banks, caused primarily by the gradual collapse of the class barriers between bank management and clerical occupation. At the same time, the educational backgrounds of employees and in-house training converged to define a set of desirable skills for future bankers: that of the highly qualified, quantitative sciences graduate. The nature of banking activity, largely defined as quantitative, assisted the establishment of this expertise framework. That overall setting, in its turn, attracted professionals from Accounting, Finance, Economics, Mathematics and Engineering, all highly skilled in mathematical knowledge and comfortable with manipulation of numerical data. It was arguably on the basis of this framework of professionals that the introduction of methodologies like Cost-Benefit Analysis, Payback and later-on NPV occurred in technology valuation processes. The dominance of these expert groups in higher managerial posts apparently influenced the trajectory of technological investment valuation in the 1980s and early 1990s by establishing quantitative assessment as primary decision practice. Along these lines, the increasing complexity of new technologies was to be addressed through the application of further sophisticated techniques, yet again coming from the Finance, Statistics and Mathematical Economics grounds, and focusing on accuracy of calculation rather than on readdressing the context of implementation.

The period that followed the mid 1990s and extends to the present is, in terms of the 'expertise – valuation' relationship, one of complex and ambiguous developments. On the one hand, the invasion of the newly empowered IT professionals into Boards of financial institutions signalled the conscious recognition of IT's role in shaping the banking business. In particular, it rationalised the hard numbers perception of technology valuation by formalising alternative viewpoints on assessment of IT, such as the strategic appraisal (Ballantine and Stray, 1998; Nair, 1995; Irani et al., 1997). On the other hand, the paradigm of quantitative assessment as decision-driver, though still persisting, is negotiating its way with developments such as Real Options Valuation to embed strategic value into the world of quantitative metrics (McDonald & Siegel, 1986; Copeland & Antikarov, 2001). On top of these advancements, the debate on assessing technological value has shifted to how we should adjust our faith in numbers, according to the economic and business conditions that prevail each time (Porter, 1995). The changing landscape of expertise appears to be
gradually influencing the banks' perception and practice on technological appraisal rather deeply. I see the primary expression of this influence being the shift from sophisticated quantitative assessment, to understanding that banks need to reassess the value of technology by working at the higher organisational level. Possibly the realisation that technological infrastructure and IT at large is being transformed, from a configuration of facilitating constructs, into the backbone of the financial institution, alters entirely our perception of what constitutes banking technology and whether we are able, or indeed need to, economically appraise it in separation from the organisation itself.

Concluding Comments: the landscape of TIDM

This chapter aims to present as complete a picture as possible of the landscape in which this investigation takes place. To achieve this, it addressed UK banking in two parts: The first outlined technological developments in banking in the 20th century. This account was provided as a necessary precursor to outlining and understanding the conditions and idiosyncrasies of technological investment in the banking sector. The second part revisited the historical discussion with view to identifying, analysing and establishing connections between the evolution of expertise in UK banking and the observed perceptions and attitudes to technological investment.

Banking in Britain has been an important force for economic growth and also a field of innovation and high achievement. As proposed in this chapter, the implementation of technology in British banking from the early years was based on the inherently innovative nature of the UK banking business. That was not only because of the nature of the business itself, but also because of the particular regulatory or other conditions that permeated Britain’s social, political and economic conditions in the 20th century. The history of UK banking technology can largely be seen as a parallel to the history of computers, as this type of equipment, from early accounting machines to modern CRM systems, was at the centre of banking technical developments. The evolution of UK banking technology happened around a series of events that reflected prevailing socio-economic or political conditions. Under these conditions, in some instances a number of bottlenecks, or reverse salients, to use Hughes's term (Hughes, 1983), gave the impetus to British banks to move on to new stages of technological development. In other instances, such impetus was provided by identified opportunities that UK banks needed to address to grow their business. Yet again, other instances saw banks mobilising technological innovations to cope with regulatory or other government intervention in order to maintain their business interests.
Most frequently, technology has been introduced in UK banking to address clearly circumscribed problems. In many cases, this 'solution by technology' has opened new perspectives in the way that the banking business itself was focused and, in the extreme case of the late 1990s, it has challenged the traditional organisational structures. Ever since the first accounting machines were used, technology has played not only the role of introducing new forms of automation or processing, but also an enabling role for older, more mature technologies. Mostly generic technologies, such as ICTs, RDBMS and the Internet have brought specific mature banking technologies, such as ATMs, call centres and home banking to new dimensions: EFTPOS kiosks, integrated CRM systems and Internet Banking systems respectively, were such new applications. This role of technology presents a recurring pattern within discontinuous technological trajectories, as the role of enablers is arguably played each time by revolutionary concepts that prompt breakthrough developments in more industries.

In addressing perceptions on the value of technology, as these are historically recorded, a key role is given to the evolution of expertise in UK banking. British banking has come a long way from being dominated by noble businessmen with no homogeneous or relevant educational background, to today's Boards of Directors, composed of people of a diverse, but rather specific to the trade, range of expertise on Finance, Accounting, Technology, Law and Banking. The development of expert groups in UK banking was in the early days driven by a tradition that segregated banking clerical labour from managerial activity, a tradition that had to break in light of both the enabling effects of technologies that decentralised management tasks and the identified efficiency gaps. Notably, professionals of particular backgrounds on Banking, Finance, Accounting and Economics dominated the higher managerial levels of financial institutions as late as the 1970s, when the effects of both the recruitment of well-educated graduates and specialist scientists were felt. This development followed an equally high rate of scientific advancements in Mathematical Economics, Forecasting and Finance. Technological expert groups did not appear among the practitioners until quite late. That was because, first, of the dispersed nature of banking technologies early on, which didn't call for centralised technological skills. Second, the appearance of technological expertise had to wait until the attitude of banks to Information Systems changed, until banks were institutionalised with role-specific departmentalisation taking effect, and until dominant expert groups of Bankers, Actuaries, Accountants and Economists began relying heavily on technologies.

The impact of the evolution of banking expertise on established perceptions on technological investments is not always transparent. This chapter proposes that there is a subtle relationship that results from the negotiation between dominant expert groups on how the bank should evaluate technological investment. In all reviewed respects, what is ultimately at the centre of TIDM approaches, are the power interests of expert groups.
that account, professional communities of practitioners negotiate the development of constructs through which decisions are taken. They arguably do this with view to imposing their own expert knowledge as key to managing and controlling these constructs and, through them, justify decisions of their own preference. TIDM techniques are, in that respect, serving the role of a channel through which professional groups promote their collective interests; objectifying this channel is what provides dominance over decision-making.
Chapter 5: Industry Players in UK Internet Banking: Background

Introduction

Chapter 4 offered a historical review of developments in UK banking technology. That served both to contextualise the overall inquiry of the thesis and to provide insights into the relationship between historical TIDM patterns and developments in expertise in UK financial institutions. It demonstrated that the perceptions that permeated technological decisions in different eras were explicitly or implicitly informed by the socio-economic conditions of the period, the dominant technological paradigms and, most importantly, the structure of expertise in the bank.

Following that historical analysis, the present chapter addresses the second part of the UK banking landscape: that referring to Internet Banking. It consists of two parts: a review of UK Internet Banking providers accompanied by a brief account of their entry strategies; and a more extensive discussion of the case studies of the particular financial institutions participating in the empirical research. Similar to Chapter 4, this chapter also follows a spiral approach where more generic background information is initially provided, later to be leveraged within the concentrated discussion of the case studies.
Industry Players and Strategies for UK Internet Banking: Implications for TIDM

This section discusses UK Internet Banking in two stages. The first provides an overview of the industry, identifying participants and addressing some of the key aspects of the question of Internet Banking. The second stage focuses on the industry's strategic outlook, with the aim of examining the role of firms' strategic orientation to their overall TIDM approaches.

A Review of Industry Participants in the Internet Banking Sector

The antecedents of UK Internet Banking are located as far back as the mid 1980s, when Bank of Scotland, Clydesdale, Royal Bank of Scotland and other incumbents entered into a technological race to allow customers to undertake banking transactions in the convenience of their home or office. Initiatives of this type, widely known as PC banking, used proprietary connection technologies between the bank's infrastructure and customer equipment. Such applications were most common before PCs were extensively used in office automation, and banks would provide both the terminal and connection equipment, or modem, to the customer. Despite their innovative nature, these applications were considered failures in many respects (Violano & Van Collie, 1992, p. 95). By 1990, when data communications were penetrating the home and office market, home banking services were offered, most often for a fee, through dedicated telephone links to the bank's computer system. The introduction of the Internet as a non-dedicated, wide-access network introduced significant change to the economics of this pattern, and the emergence of Internet Service Providers (ISPs) as points of connectivity for home and office users contributed to the demise of these early proprietary remote banking systems.

Internet Banking in the shape we know it today has been around since the second half of the 1990s in the US, with UK players entering the market in May 1997 with the first retail Internet Banking application by Nationwide, the building society that entered retail banking after the 'Big Bang' deregulation in 1986. A large number of other banks followed suit, with the emergence of the first Internet-only bank in October 1998, when Egg launched

1 Fincham et al. (1994) provide an extensive series of case studies that refer to the most important such projects.
2 This view was most prevalent in the US where the unsuccessful attempts by Banc One in 1985 and Chase Manhattan in 1989 to introduce PC-banking marked such applications as failures.
3 The first ever successful Internet Banking application was launched commercially in 1995 by the Atlanta-based Security First Network Bank (SFNB). However, the technology had been developed and tried as early as 1990 by the California based Wells Fargo Bank.
4 See http://www.nationwide.co.uk/mediacentre/PressRelease_this.asp?ID=224, last accessed 1-2-05.
its operations. Competitors at that time were also entering the market with alternative propositions, such as HSBC’s First Direct, a bundle of remote banking services with Phone and Internet Banking offered as an integrated solution. Given the favourable economic conditions and the positive attitudes to technological innovation permeating the late 1990s, the overwhelming majority of banks viewed Internet Banking as the obvious way to go for a number of reasons.

First, the high degree of technical standardisation allowed ‘off-the-shelf’ IT solutions to proliferate, significantly reducing costs. It also simplified the technical effort needed to migrate applications across firms or even industries. This pattern was echoed on the expertise side: standardisation meant generic programming and IT systems design skills were becoming universal and easily transferable across industries, thus promising a wider expertise base in banking labour markets. Second, it is an established pattern in the software and hardware industries that overcoming even quite trivial technical bottlenecks hugely amplifies the potential of usage of the technology. This can be seen in Internet Banking where the overcoming of data transfer speed problems and the proliferation of programming languages specific to Internet applications inspired businesses to recognise the enabling capabilities of new technologies in the service industry. Thirdly, within that favourable atmosphere, banks found fertile soil for advocating a new era for financial services that would revitalise investors’ interest, liberate banks from many of their costly operational burdens and transform the sector to a highly profitable service-driven and customer-oriented one. Finally, as many financial services specialist consultancies repeatedly reported, the Internet was reaching a stage of maturity that coincided with a necessity for the Financial Services sector to integrate their business. Figures 5.1 – 5.3 illustrate some aspects of that much-advocated viewpoint.

These reasons, aided by the need of the ever-expanding IT industry for new markets, led to an explosion of Internet Banking implementations, to the extent that UK banks largely considered Internet Banking investment to be of strategic importance and, in most cases, a matter of survival. Table B.5.1 (in Appendix B) lists the major UK financial institutions that were offering Internet Banking services by the fourth quarter of 2003. One may observe the high growth rate pattern mainly during the first couple of years. Naturally, this pattern of growth in the numbers of new Internet Banks was accompanied by a similar, if not overwhelming, growth in the numbers of Internet Banking customers. Relevant data are illustrated in Fig 5.4.

5 With microprocessors, for instance, large leaps of speed and capacity have often been attributed to a minor material or technique improvement. Similar examples exist in software or hardware architectures, where minor incremental developments created the basis for huge commercial expectations.
Note: Respondents were asked to rate channels by business generation from one to four, where four generates the most. The diagram shows the average rating score for each channel for retail banks.

Figure 5.1: Distribution channels as business generators by preference (source: Reuters UK Online Banking 2003 Report)

![European Internet Banking Customers](image-url)

Figure 5.2: European Internet Banking Customers (Actual figures: 2000 – 03 and Forecasts: 2004 – 07). (Source: Datamonitor)
Figure 5.3: UK Online Banking Customers 2000-02 (Source: Datamonitor)

Figure 5.4: Standalone Internet Banks are still lagging behind in online customers.

No available measure of uptake for Internet Banking provides sufficient numeric evidence that Internet Banking either functioned as a replacement technology for consumers' access to banking services, or that Internet Banking freed-up capacity within banking processes. While it has been possible to count the number of online and other transactions before and after the introduction of Internet Banking, and, from there, to observe changed patterns, such information proves inadequate for drawing conclusions as to whether
increases in the numbers of transactions can be attributed solely to Internet Banking or other operations. A bank executive has put that issue in very descriptive terms:

"...it's the same as saying 'when the tide comes in this evening, is it the same water that came the last evening?'"

For this reason, the explosion in both Internet Banking implementations and numbers of Internet Banking customers hardly gives a solid numerical justification for Internet Banking as a market-pull application.

Overall, from 1999 to 2003 much of the activity in the UK banking industry was focused on technological developments and, in particular, those relevant to Internet Banking ventures. Other technological propositions were also pioneered, such as mobile banking (also known as m-banking) and many changes were made in the world of payment systems. As a consequence, much of the professional activity, recruitment efforts and organisational restructuring activity has been driven by the new technological priorities of UK banks.

The prevalent image at that time of what Internet Banking was and how it would benefit the organisation was obviously one that can historically be held responsible for the overestimations and subsequent disappointments in Internet Banking implementation projects. Such misperceptions were not only driving IT overspending and change prioritisations single-handedly, but also appear to have downgraded the significance of appraisal processes, financial or strategic. What is evident, in hindsight, is that a sense of urgency for competitive positioning contaminated the UK banking industry, with Internet Banking at the centre of it. As a result, established decision making processes, hierarchical structures and internal regulations for financial rigour seemed to collapse under that pressure.

In no other way can that be better illustrated than by looking at the processes for technological investment decision-making (TIDM). TIDM is a perfect test bed for scrutinising the impacts of the Internet in UK banking for a number of reasons: first, patterns of decision-making reflect the dominant policies of the firm, regardless of established structures and well laid-out processes. In a way, they transpire as practice as opposed to process, and this is an extremely valuable instrument for identifying – or even anticipating – change in the firm and the sector. Second, TIDM encapsulates and 'records' the balance between economic rigour, undoubtedly the long-prevailing argument of financial assessment, and strategic rationality, a clear reflection of the firm's perception of the market. In so doing, because TIDM is a process about technology, it further reflects directly to the firm's technology strategy.

In addition, the history of Internet Banking offers an excellent platform for examining the evolution of professional and technological expertise in UK banking. Distribution of expertise, I propose, largely determines the dominant viewpoints on technology and,
because of that, influences the perceptions of technological value and, thus, its estimation. This is addressed in the last section of this chapter.

**Strategies for Internet Banking in the UK**

Dominant views about treating technology, in its organisational setting and with the aim of ensuring future profitability for the firm, are formalised as *technology strategy*. The use of strategy as an instrument positions the firm within a broader 'map of competitors' in the industry. It all also provides a sense of direction in the firm's corporate goals. In these respects, strategy is seen in both *absolute* and *relative* terms. Academic literature offers a wealth of approaches to technology strategy, especially since firms began viewing technology as an active participant in the shaping of the organisation.

The landscape of UK Internet Banking, as discussed here, is populated by a significant number of players, as almost all of the larger UK retail and corporate banks see Internet Banking as an essential-to-have feature. In the current analysis I provide a broad-level account of the strategies of entrants into Internet Banking. By definition, such strategies are seen as specific technology strategies, despite the high significance of Internet Banking for the firms' overall corporate strategies. This point illustrates the pertinence of technology for corporate strategy. Three main categorisations of Internet Banking technology strategies are presented to provide a relative positioning of Internet Banking-introducing financial institutions on the basis of: (1) their total mode of operation with respect to Internet Banking; (2) the role of Internet Banking in the entry to the banking industry; and (3) their overall attitude to competitors' strategies (Freeman & Soete, 1997: pp. 265-285 and Ansoff & Stewart, 1967). This approach provides two main benefits: First, it facilitates a clearer demarcation of the firms in the sample into classes that can better reflect formal and practical attitudes to technological investment. Second, it addresses TIDM for Internet Banking indirectly, since a firm's chosen technology strategy mirrors its commitment to invest and, by association, its decision processes for allocating resource to Internet Banking.

The first dimension, namely how Internet Banking relates to the total mode of the firms' banking operations, categorises UK banks by business model. Three types are distinguished:

1. **Standalone Internet Banks**: banks that were either set-up by existing financial institutions or by non-banking firms to provide banking products through the Internet channel. For Standalone Internet Banks, Internet Banking is an essential part of the overall business model.

2. **Integrated Internet Banks**: financial institutions that developed Internet Banking capabilities in addition to their existing banking operations, to provide mostly existing
products through an alternative channel. This business model suggests treatment of Internet Banking as an additional channel rather than as a business mode.

(3) **Standalone and Integrated Internet Banks**: existing financial institutions that, often in addition to becoming Integrated Internet Banks, developed spin-off or other operations as Standalone Internet Banks. In terms of the business model, this mode involves the development of new Internet Banking-based business models on the back of existing strategies.

Table B.5.2, in Appendix B, illustrates the three types, some examples of UK financial institutions following these strategies and a list of strengths and weaknesses. In all three strategies, the factors that influence entry choices largely relate to issues such as resource availability, competitive conditions in the market, external factors such as national policies and regulatory conditions, the maturity of the involved technologies, and the technology strategy of the firm. Furthermore, each entry option comes with particular risks as well as gains with regard to cost and performance of implemented technologies. Reportedly, at the time of this research, Internet Banking offerings by standalone banks have attracted significant numbers of customers, leading to growth in their customer and revenue base. As indicated in Table 5.1, the integrated model has also allowed incumbents to offer their existing customers online access to their accounts. However, this does not necessarily indicate revenue growth from online activity: getting the customer to effectively replace the branch channel for online banking depends on a multitude of parameters that relate to technical literacy, age, financial sophistication, user-friendliness of the service and more.

Table 5.1: Customers banking online with major Internet banks and banks providing Internet banking services in 2003 *(Source: E-banking Strategies in Europe, 2003)*.

<table>
<thead>
<tr>
<th>Internet Bank</th>
<th>Number of customers (m)</th>
<th>Bank providing Internet services</th>
<th>Number of customers (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg</td>
<td>2.6</td>
<td>Barclays</td>
<td>3.9</td>
</tr>
<tr>
<td>Smile</td>
<td>0.7</td>
<td>Lloyds TSB</td>
<td>1.9</td>
</tr>
<tr>
<td>Cahoot</td>
<td>0.4</td>
<td>HSBC</td>
<td>1.2</td>
</tr>
<tr>
<td>First Direct</td>
<td>0.5</td>
<td>NatWest</td>
<td>1.0</td>
</tr>
</tbody>
</table>

The second dimension refers to the traditional segmentation of competitors by degree of change in the character of their operations, introduced by the use of Internet Banking technology. That distinguishes between incumbents, related entrants and unrelated entrants. A brief explanation of the three segments is provided here:

(1) **Incumbents** are firms for which the introduction of Internet Banking technologies causes little change in their business character. The term refers to existing bricks-and-mortar banks that implement Internet Banking to extend their operations or
pursue other strategic or economic goals. In relation to the previous dimension, incumbents may operate under any of the three models (Standalone, Integrated or 'Mixed'; Internet Banks).

(2) **Related Entrants** are firms that extend their financial services operations into banking by using Internet Banking technology as an enabler for entry. Building Societies, Insurers and Stock-broking firms belong to this segment. However, Internet Banking, in the majority of cases, has not been the sole entry to Banking services as most related entrants had made similar expansions with the ‘Big Bang’ deregulation of 1986.

(3) **Unrelated Entrants** are Internet Banking businesses spun-off by non-financial sector firms which use Internet Banking technologies as entry strategies to become active in the UK Financial Services industry. Such firms either develop Internet Banking business models anew, or enter partnerships with financial institutions. Unrelated entrants usually hold expertise, know-how or other significant advantages on which they expect to capitalise. Examples of these advantages include an enlarged customer base, a range of products that can easily be bundled with financial services, or existing strength in IT infrastructure or expertise.

A division of major UK Internet Banking providers into these three segments is provided in Table B.5.3 in Appendix B.

The third and last dimension is that of taxonomies of technology strategy. The fact that technology strategy is placed in a pivotal place in the organisation is supported by the increasing formalisation of technological expertise in higher management of firms, with the institution of roles such as CTO (Chief Technology Officer) and CIO (Chief Information Officer) even in non-technology firms. Finally, technology strategy is imposed, one could say, as a necessary feature in the corporate agenda, by dominant market perceptions, institutional investors and, primarily, competition.

Freeman and Soete (1997) provide a categorisation of technology strategy by characterising the organisations’ stance according to their competitors’ positions, availability of technological resource, overall corporate strategic goals and other elements. A brief description of these strategies is provided in Table 5.5. An account of Internet Banking competitors under that technology strategy categorisation often reflects historical relationships of the particular financial institution with technological competences and IT expertise. Despite being a clear categorisation, placing a particular financial institution into segments of the Freeman & Soete’s framework is not a straightforward task. The primary reasons for this lie in the nature of Internet Banking technology itself in that Internet Banking technology is spread across all levels of transaction processing, account management, information filtering, and service delivery. Internet Banking implementation concerns all the three types of banking technology, as discussed by Steiner and Teixeira (1990, pp. 59-67)
namely core technology (M1), applied technology (M2), and technology related to business needs (M3)\(^6\).

**Table 5.2: Taxonomies of Technology Strategy\(^7\)**

<table>
<thead>
<tr>
<th>Freeman</th>
<th>Ansoff and Stewart</th>
<th>Key features</th>
</tr>
</thead>
</table>
| Offensive | First to market | • get products to market faster than competitors  
• High R&D investment  
• High internal coupling |
| Defensive | Follow the leader | • strategy is timing  
• Profit from mistakes of early innovators  
• Requires greater production and marketing skills  
• Superior competitive intelligence |
| Imitative | Application engineering | • Cost leadership  
• Low R, average D investment  
• Strong in design and production |
| Dependent | Application engineering | • Cost leadership  
• Low R&D investment  
• Strong in production |
| Traditional | Me too | • Cost leadership  
• Very low R&D investment  
• Market or competition do not require major product changes |
| Opportunist | | • Entrepreneurial  
• No R&D investment |

The description and strategic view of the UK Internet Banking landscape provided here serves a dual role: first, it complements the overview of banking history, provided in chapter 4, through focusing more specifically on the strategic and economic factors. Second, it circumscribes the technical, economic, organisational and strategic setting within which the problem of TIDM is investigated. In this respect, discussing the strategic aspects of Internet Banking strongly links to TIDM, by reflecting the perceptions of interested parties on what the intrinsic value of Internet Banking is, and how it should be gainfully implemented. The remainder of this chapter provides background on the financial institutions used in the case studies of this work. It draws both on documentary evidence as well as on up-to-date information that was disclosed in interviews. This allows for focusing the discussion on expertise development and the resident processes for TIDM.

**Discussion of the Case Studies: background**

This thesis uses case studies to bring empirical data into context. Rather than focusing on each Internet Banking project that interviewees refer to and addressing

\(^6\) The authors propose M1 to be the lowest technology level, effectively supporting the other two. M1 is the hardware-based part comprising the data centre, networks, system software but also knowledge and techniques. M2 is the software-oriented part that includes applications portfolios, know-how clerical staff and more. M3 is the end-user-oriented part referring to business strategy, marketing, sales, customer service and trademark.

\(^7\) Adapted from Implementation E-Learning Materials (2001), The Management of Technology, The University of Edinburgh Management School
implementation issues around that, it focuses on opinions, perceptions and assumptions of interviewees on the basis of their expertise, position, educational and professional background; it uses reference to specific Internet Banking projects as locators rather than as key parameters that drive the investigation. The whole discussion draws on documentary and interview data. The present section discusses the background of the organisations involved with regard to two key aspects: (1) TIDM processes and methodologies; and (2) the development and role of expertise in the firm. The section begins with a brief account of the rationale for selecting and processing the interview material. Subsequently, empirical data are discussed on a case by case basis.

The firms that were selected for this research fell into all three categories of incumbents, related entrants and unrelated entrants, with regard to their Internet Banking activity. This ensured ample coverage of the landscape of Internet Banking developments at the time of the investigation. Although it initially provides no clear indications that are relevant to the TIDM problem, this categorisation is a useful approach to the attitudes of financial institutions towards new technologies, given the pertinence of the Internet in contemporary banking and the importance of effective appraisal of technologies for entering the sector.

To accommodate the multiple dimensions of analysis, two further categorisations are used, each addressing different aspects of empirical data: (1) that distinguishing primary from secondary cases or firms; and (2) that of financial vs. non-financial background of interviewees. The first of these categorisations follows the outrigger model where a set of in-depth or more detailed cases is supported by a set of outline cases. On the other hand, the categorisation by expert field serves as a dimension that cuts across organisational particularities and seeks to identify commonalities in how managers of similar background in education or professional training address technological investment. Finally, a timeline element is accounted for in this analysis. Empirical work is quite extended in chronological terms (late 2001 – early 2004). These elements are illustrated in Tables A.1 and A.2 and Figure A.3 in Appendix A.

The next few paragraphs present the background of the investigated firms in relation to their Internet Banking activities, with special reference to TIDM patterns and the evolution of expertise. It also briefly looks at the professional status of the interviewed individuals and involvement in Internet Banking projects. Naturally, the empirical data is addressed by organisation with primary cases discussed first. This background account starts with the two primary financial institutions (RBSG and IF); the remaining eight follow. The two primary

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8 The model was explained in more detail in Chapter 3.
9 Two of the interviews were conducted with non-retail banks; these involved individuals working for third parties, who, however, have significant experience in Internet Banking project appraisal or aspects of direct relevance to TIDM in banks.
cases are addressed in separate subsections, with specific reference to their history of expertise development and technological appraisal; the background concerning all secondary cases is provided in one subsection. That is not to diminish the pertinence of data arising from these cases. It simply reflects that the level of detail needed for secondary cases is lower.

The Primary Cases:

The Royal Bank of Scotland Group

The Royal Bank of Scotland Group Plc. (henceforth RBSG) is one of two firms that form the primary empirical material. During the investigation, RBSG became the second largest bank in the UK measured by market capitalisation (Reuters, 2003a) following its acquisition of Natwest in March 2000 and a number of expansionary actions abroad. RBSG has over 2290 branches, 5100 cash machines and operates through seven main divisions in more than 140 countries\(^{10}\), making it a highly geographically and operationally diverse entity.

The strategic direction of the firm long involved a paramount role for technology (Fincham et al., 1994); this tendency was significantly magnified during the late 1990s and early 2000s, primarily due to (1) the establishment and organisation of resident expertise on IT, (2) the acquisition strategies of the Group throughout the 1990s, which notably involved technological drives and (3) the drive for functional – and subsequently technological – integration that followed the expansionary efforts.

The bank’s structure had been completely reshaped in 1992 in response to financial problems mainly related to its expanding cost base, high debt levels and operational inefficiencies. Changes involved a transition to a less hierarchical approach, necessitated by both the Group’s expansion and the changing structure of banking business. The new structure featured (1) the American Business, (2) the Retail Banking Business, (3) the Corporate Banking Business and (4) a support operation for the Retail and Corporate functions (1.2, §6). Given its immediate need to cut the cost base, the Group invested heavily in telephone banking operations to migrate customers away from the expensive branch and into cheaper channels\(^{11}\). This eventually evolved into Direct Banking. Counter to expectations, alternative channel operations generated additional volume of transactions;


\(^{11}\) RBSG had historically leveraged technologies to compete with the larger and more powerful English banks; this resulted in the development of its internal expertise in MIS and EDP during the early 90s (Fincham et al., 1994: pp. 54–60).
projections of closing branches and reducing staff levels therefore proved unrealistic. (1.2, §6-§8).

The bank’s interest in Internet Banking came in early 1995 with the setup of an information website that gradually boosted awareness in the bank of the Internet’s potentials in advertising and selling. With rapidly growing awareness of the Internet, the growing change culture in the organisation and the necessity for cost improvements, the Bank initiated Internet Banking projects. These were highly segmented, apparently for two reasons: the platform compositions and technical specifications were unclear and unstable; and because no consensus existed as to the business role of the Internet, business plans were politically charged by conflicting opinions on how Internet Banking ventures should be set up and run (1.2, §6; 1.3, §15). This resulted in three years of unsuccessful attempts that eventually led to the launch of Digital Banking, a Windows-based system in 1998. (1.2, §6; 1.4, §18)

During the Internet boom, the bank’s investment appraisal functions were influenced by prevalent views that Internet Banking was a necessity that needn’t be justified through the conventional approval processes. Internet-related projects were seen as ‘no-brainers’ (1.5, §14; 1.8, §47), projects that were not subject to the cost justification procedures that other infrastructure projects were (1.6, §24). That perception was further strengthened by an initiative to establish the E-Commerce and Internet division in 1998 (1.1, §2). Along with that perception, the relative weight of the bank’s Finance function was implicitly reduced: since IT investments were attaining a status of extreme importance for the future of the bank, relevant decisions received direct support from higher management levels; this altered the role of Finance from a control function of economic health to a support mechanism for decisions that were already taken at a higher strategic level (1.7, §15; §35; 1.8, §31). In this period, Finance in the Royal Bank apparently maintained ownership of formal liaisons between the investing departments and the more traditional structures such as the ones relevant to compliance and regulation (1.8, §17; 1.7, §5). That particular role was long prescribed in the bank’s hierarchies and remained largely unaffected by the prevalence of Internet-based IT applications. In line with wider industry trends in the late 1990s and early 2000s, perceptions about IT investments evolved from growth-based/innovation-driven to ones more relevant to sustainable and measurable economic benefit. Opinions within the bank had it that this was largely an effect of the economic cycle (1.1, §4; 1.7, §15; 1.8, §8). An interesting effect of that perception change was the revitalisation of traditional accounting attitudes in IT decision processes; that was widely seen as the result of the re-establishment of Finance and Accounting experts as gatekeepers of the firm’s financial health (1.3, §21; 1.5 §12; 1.6, §42;). However, despite the widespread recognition in the firm of IT investment idiosyncrasies, the bank did not embrace any of the IT-specific methodologies for investment appraisal available (1.1, §22; 1.3, §11; 1.4, §22-24; 1.7, §28); instead, assessment inefficiencies of the dot-com boom era were seen as the result of relaxed application of
economic standards at the project level; improvement was therefore sought in better application of existing assessment procedures and increased control of decision processes.

In the period since the dot com bust, banking technology moved closer to a much more stable development and diffusion of IT, accompanied by a parallel growth of experience and deeper comprehension of the new applications in the bank. The bank also began formulating clearer processes and structures for dealing with IT-specific investment decisions (1.4, §6; 1.6, §29-30; 1.8, §12-13, §17). These were largely devised to address difficulties in establishing clear decision criteria, accountability and better measurement of costs and benefits of IT. During this process, the bank gained a more informed view on how financial appraisal should be used and what the basis of project control and justification should be (1.2, §56; 1.5, §16; 1.7, §9). Accordingly, the organisation adjusted the composition of project teams with the presence of representatives of Finance and IT being at the centre of that reform.

Expertise in the bank also evolved. Following a surge in recruitment of IT-skills in the second half of the 90s, the dominance of technical professionals diminished as Internet Banking technology (especially that related to security) became increasingly standardised across the industry and thus easily transferable, or even subject to outsourcing (1.1, §16; 1.2, §62; 1.5, §57; 1.9, §16). Simultaneously, the bank began developing a deeper understanding of the business implications of IT, and Internet Banking technologies in particular (1.1, §44; 1.2, §14; 1.4, §2; 1.5, §16-18). That realisation gradually infused the higher management levels with IT-savvy executives who understood the transformational role of IT in the firm’s operation. The changes in the structure and composition of project groups were partly responsible for that IT skill diffusion; furthermore, these changes apparently led to cross fertilisation of technical and business skills that resulted from the pressing need for IT project members to provide convincing justifications for their project performance.

**Intelligent Finance**

Intelligent Finance (IF) was launched by the Halifax building society in the fall of 2000 as a standalone telephone banking (Sep. 2000) and later Internet banking operation (Nov. 2000)\(^\text{12}\). Backed by an initial investment of £120m, IF has been highly successful with over 600,000 customer accounts and a website that receives over 2m hits per week. By the end of 2003, IF had more than 800,000 customers, assets of £15.5bn and had increased customer deposits by 27% on the year\(^\text{13}\). It currently offers a full variety of financial services such as mortgages, current and savings accounts, personal loans and brokering services. Because the whole company setup revolved around offering ‘offset mortgaging’ products, IF

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enjoyed the advantage of the already strong mortgage customer base of Halifax. Furthermore, IF’s customer acquisition growth was backed by HBOS, the entity resulting from the merger of Halifax and Bank of Scotland in 2001. IF is a representative case of a telephone and Internet bank, set up by an incumbent financial institution. Similar cases include Smile (developed by the Co-operative Bank), Cahoot (by Abbey National) and Egg (by Prudential). Intelligent Finance was spun-off as a separate entity by Halifax, as a result of the Board’s perception that a financial institution that would rely on leveraging the potential competitive advantage of the Internet and other remote channels should have a separate structure, management and culture from the traditional rigid parent financial institution (2.1, §5-8).

The set-up of Intelligent Finance coincided with the bursting of the dot com ‘bubble’, which makes the examination of its TIDM structure particularly interesting as regards the company’s processes. IF has been idiosyncratic in a number of respects. First, because of its time sensitivity with regard to competition, it had to be set-up at speed; second, unlike competitors such as Egg or Smile, its profitability plans were based on the customer proposition of ‘Offset Mortgaging’ (2.1, §6, §15). Finally, since its strategy was detached from its parent firm, Halifax, its corporate structures and operational rationales were completely different from traditional banking organisations, a characteristic that was further augmented by its huge reliance on IT infrastructure.

IF’s investment appraisal processes were largely defined anew, primarily for two reasons: (1) the nature of its activities was distinctively different from those of Halifax, its parent, since IF’s launch was based on the new proposition of offset mortgaging and bundling of products such as credit cards and personal loans; and (2) the bank’s operation was hugely reliant on IT that had to be developed from scratch, within budget, on time, and gain regulatory approval and customer acceptance (2.1, §15, §20; 2.3, §6; ). Typically, the development of TIDM processes was greatly influenced by the stage at which IF was at the time the empirical investigation took place (spring – summer 2003); being at the last stages of its growth period and entering the establishment phase, TIDM was carefully managed as a balance between the measurable-quantifiable and the more intangible aspects of the business. On the one hand, during the initial growth period, significant investment in IT infrastructure was justified by the fact that the IT and business strategies coincided (2.1, §15-16; 2.2, §6-8). This encouraged a more flexible and intuitive application of technological decisions. On the other hand, at later stages of sustained performance there have been a large number of IT-related propositions or ideas that were subjected to more searching scrutiny on the grounds of their projected financial performance. At the time of the interviews, that was defined by a centrally prescribed ROI (Return on Investment) of 2 to 1 that was imposed on the basis of the firm’s broader strategy for financial breakeven (2.2, §12; 2.4, §13, §54).
This shift to more rigorous processes for investment decisions was reflected through a Change Programme put in place by the Executive for achieving migration from the start-up phase to a sustained and mature business (2.2, §8). Interviewed executives reported that the basis for this programme has been the need for establishing accountability within the appraisal processes as a way for rationalising the delivery of desired benefits (2.2, §14, §30; 2.5, §49-52). This was also sustained through introducing ownership of benefits in project groups (2.2, §13; 2.3, §26; 2.4, §48). As part of the overall Change Programme, the role of Finance was seen as an organic one across different project groups, providing input through challenging the viability of projects. In that respect, no ‘silo’ approach was observed in IF; despite that, financial hurdle rates were imposed at the higher level (1.1 §26; 1.3, §18) during the breakeven period.

Expertise did not appear to be a significant problem for IF’s operations, according to the empirical data. Due to the changing state of development in the organisation during the investigation period, executive roles underwent some change to reflect the shift from the start-up to the more mature phases. Furthermore, interview data did not suggest the existence of expertise-based silos. Interviewed executives reflected an integrated view of how different ranges of expertise are used in TIDM processes. According to this view, each IT proposition is backed by expert groups, whose representatives commit to deliver benefits that tie into their own field of specialisation (2.4, §22). Executives of higher rank supported that inspiring market-minded rationales to experts from different backgrounds should be at the forefront of the firm’s tasks; this was seen as more pertinent to success than the establishment of any of the traditional industry expertises, such as Banking, Finance, Marketing, or IT. (2.2, §62)

The Secondary Cases

The empirical investigation included an additional eight financial institutions, totalling 17 interviews. Most of these were addressed through one or two interviews each, which were typically carried out at later stages of the research, when the investigated landscape was relatively familiar. Broadly, involvement of these firms in Internet Banking ventures happened at different levels: organisations such as Egg, Cahoot or Virgin One (later OneAccount) were highly dependent on Internet Banking technology, along with players like Smile. On the other hand, players such as HBOS, Abbey National and Goldfish appeared to come in from the perspective of developing alternative channels for their products, with a view to serving their existing customer base. We now briefly look at these cases.

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14 Indications for such changes are provided by the quick changes in the hierarchies in terms of job roles.
Egg Plc

Egg bears strong similarities to the case of Intelligent Finance. Launched in 2000, Egg is a wholly owned subsidiary of Prudential Insurance. By 2002, Egg had already acquired a customer base of 2 million, contributing to the firm’s impressive revenues of about £700m, making it the leading standalone UK Internet Bank.\(^\text{15}\)

Rather than relying on a special customer proposition such as mortgage offsetting, Egg was largely based on offering conventional current and savings accounts, credit cards and personal loans; differentiation came from Egg’s aggressive policy of offering low-cost, competitive rate financial products (3.1, §38). TIDM was central to the firm due to Egg’s exclusive reliance telephone and Internet channels for its operations.

In relation to technological investments, speed of decision was the key element identified by interviewees as Egg’s competitive edge against incumbents, where Internet-related projects would take much longer to be considered. This was attributed to the firm’s flatter hierarchies in decision-making (3.1, §6). Unlike IF, the empirical data for Egg indicated a rather conventional and strictly demarcated role for the Finance function in TIDM, primarily because the firm’s centrally prescribed benchmarks were of a financial nature (3.1, §33; 3.2, §12) and adhered to its policies of developing shareholder wealth as the key target. Interviewees supported the view that Finance is treated as ‘one of the factors rather than the overriding one’ (3.1, §33); however, while decisions on technological investments were said to be taken at a high level and on the basis of multiple arguments, the financial one appears to bear exceptional influence (3.1, §34). Impressions on the use of TIDM techniques also supported the distinct role of Finance, with evidence being: (1) the existence of clear normative relationships between financial metrics and overall performance — the so-called ‘shareholder value methodology’ - (3.1, §45; 3.2, §41); and (2) the separate role given to tangibles through the separation between clearly measurable items and intangibles that are only defendable on grounds of strategic benefits (3.1, §42; 3.2, §12-13).

Ever since it was set up, there was a conscious effort in Egg to encourage interaction between different expert groups and management levels, primarily through using open-plan office space and empowering informal communications as “the way that things get done” (3.2, §45). This attitude may be responsible for the prevalence of marketing-related expertise in the bank, relevant to the development and delivery of products to the customer and fuelled by the high mobility of higher executives across expert areas (3.2, §50). On that account, interviewees reflected the view that expert power had shifted closer to the customer end.

The Bank of Scotland

One of the major secondary cases was Bank of Scotland (BoS)\textsuperscript{16}. One of the pioneers in the introduction of IT during the late 80s and early 90s, BoS is the parent company of the HBOS Group Plc., formed after the merger with the Halifax building society in 2001. In 2002, the combined entity was the largest home mortgage lender in the UK, with revenues of approximately £16.7bn and employing about 63,000 people\textsuperscript{17}. The group, at that time, was the UK’s fourth largest bank behind HSBC, Royal Bank of Scotland and Barclays.

Despite its large market share and technological abilities, BoS was rather late in implementing Internet Banking retail services, instead focussing its IT strategies on its corporate banking arm where it saw more potential for expanding and improving its existing technological portfolio (4.1, §24, §34). Retail Internet Banking strategies were pursued through two channels: (1) the extension and migration to the Internet of its existing Home and Office Banking System (HOBS), primarily aimed at corporate customers; and (2) the merger with Halifax and – with it – Intelligent Finance, the telephone and Internet bank.

The TIDM processes at BoS, as they appear through the empirical data, follow the typical structure of investment decisions in big organisations: they comprise long cycles of reviewing, following detailed methodologies and needing to be signed off by representatives of the organisational ‘silos’. (4.1, §24) That overall established practice for TIDM furthermore encouraged the exercise of power at different levels, as it relied on the highly hierarchical structure of BoS. The sheer size of the firm had further effects in terms of its expertise base: for one thing, the development of large scale corporate and retail IT systems that support the necessary flexibility, scalability and performance was outsourced to partners such as IBM and Xansa, which in turn developed proprietary banking systems expertise; as a result, the bank lost an opportunity to retain systems knowledge internally (4.1, §16; 4.2, §44).

The prevalence of the corporate culture of the big bank in BoS was further reflected in the way it balanced the roles of Finance and Strategy functions, with Finance appearing to play a significant ‘filtering’ role for IT propositions, based on centrally prescribed, short-term requirements. Longer term benefits as well as those of a more intangible nature are treated through advocacy-based processes where the case is debated at the strategic level (4.1, §32; 4.2, §54).

Standard Life Bank

The case of Standard Life Bank (SLB) was briefly reviewed through documentary evidence and two interviews. At the time of the investigation, SLB was a wholly owned

\textsuperscript{16} Despite the fact that BoS and IF were both part of HBOS at the time of the investigation, the two firms were reviewed separately in light of their entirely separate strategies for Internet Banking.

subsidiary of Standard Life, the insurance group, which featured 5 million customers worldwide, and total group assets of £94bn. In 2003, SLB had £8.7bn worth of mortgages under management. Internet banking strategies in SLB were largely driven by the wider group strategies of using alternative channels as means of entry into the retail banking and mortgage market. As with many other banks, introduction of Internet Banking followed the establishment of call centres to support phone banking. SLB was set-up as a separate division, although accountable to the wider Group. Given the long and deep-rooted history of traditional financial intermediation that Standard Life adhered to, that setup had significant impacts on the establishment of TIDM processes, the development of in-firm expertise and the shaping of traditional corporate roles in the new environment of UK banking.

The impressions gained from the interviews were that technological decision-making processes, as distinct activities, were a relatively new element in the firm (5.1, §51). At the same time, traditional hierarchical structures more apparently influenced the character of such processes, with the Finance function playing an implicit filtering role in the approval for IT projects (5.2, §10). TIDM was largely a process of advocacy, rather than one of assessment and measurement (5.1, §36-38). As a result the balance between measurable costs and benefits on the one hand and long-term strategic benefits was proposed in the interviews as relying on political positioning and the ability to persuade powerful individuals into sponsoring projects (5.2, §22, §30). As such, the tendency in the firm to promote and use sophisticated techniques for financial or strategic appraisal has been very low, since a need for that was not recognised (5.1, §47). Instead, SLB appeared to stick to conventional economic appraisal techniques (ROI, NPV, IRR) for technological investments, while using the decision-making function to make clearer sense of the economic costs and benefits in the business context of the applications (5.1, §12, §47; 5.2, §10).

The strong traditional hierarchical culture in SLB that was identified in the interviews may be seen as one of the key elements driving expertise in the organisation; the interview evidence suggests that expert groups and roles have largely remained unchanged (5.2, §16, §56); within that environment, it is proposed that the rise of Internet applications created a demand for new expertise to bridge the gap between technology and the business (5.1, §55). Along the same line of thinking, post-implementation reviews (PIR) are used in the conventional 'error-monitoring' role, instead of becoming a learning device that facilitates the management of knowledge (5.2, §8-10).

The overall picture of SLB is of a large, strongly hierarchical organisation, where TIDM is driven by resident expert groups and guided by reporting structures, and where Finance and Strategy appear to have separate roles.

The One Account (formerly Virgin One)

The One account, (formerly Virgin One), was briefly looked at through documentary evidence supplemented by a single interview. Virgin One was set-up in 1997 based mainly on the staff and resources of Virgin Direct and the Royal Bank of Scotland. By 2000, Virgin Direct had more than 330,000 customers, mainly providing pensions, insurance and savings products\(^{19}\). As of 2001, The One account is fully owned by The Royal Bank of Scotland Group.

In the same manner as other pure-play banks, The One account appeals to a retail banking customer segment of higher technological sophistication, as well as more propensity to control their finances (6.1, §10, §24). The customer proposition of The One account is similar to that of Intelligent Finance, and is based on using mortgage products as the centre for total management of the customers' finances, aiming at providing incentives for individuals to migrate all their financial products with one provider. The fully functional Internet service was launched in 2000.

Decision-making at large is reported as being a rather quick process that goes through a minimal number of hierarchical levels (6.1, §28); this pattern coincides with that of other small and flexible organisations, such as Egg and IF, and verifies the observed positive correlation between size of firm and complexity of decision-making. The organisation’s view appears to be that qualitative assessment is more appropriate to smaller and more immature firms, and that as the organisation grows, quantification should be more extensively used (6.1, §46, §52). This is expressed through a tendency to increasingly use quantitative measures as decision criteria (6.1, §50, §54). Despite that approach, the necessity was stressed for careful selection and monitoring of quantifiable entities, as opposed to attempting to cover every single element of new technology through measurement (6.1, §56). However, there was no indication that The One account uses sophisticated or otherwise IT-specific assessment methodologies, other than traditional financial measures (6.1, §64-70).

Professional expertise appears, according to the interviewee, to follow a rather traditional structure that revolves around three key areas of Marketing, Finance and Technology (6.1, §74); these areas are also seen as the ones from which new hybrid expertise is expected to develop (6.1, §76). Furthermore, the interview suggests that political power in TIDM for the organisation appears to shift towards the area of ‘direct operations’ as opposed to any particular conventional expert group. With regard to expertise development, despite the fact that knowledge management (KM) is recognised as highly important, its application in The One account is considered to be minimal, primarily due to time and resource limitations (6.1, §82, §84). Steps forward are considered through the systematic

processing and manipulation of CRM systems information, which has notably increased in both quantity and quality (6.1, §20).

Overall, The One account appears to be an organisation that lies in between the start-up, flexible and innovative self-contained organisation, on the one hand, and the firm-member of a large financial services group, RBSG. This influences its TIDM structures in several respects: on the one hand, it allows for flexible decision-making that makes deeper use of strategic insight, while on the other it restricts TIDM by centrally prescribed project performance criteria. Being part of a large group gives The One account the economic safety to undertake innovative experimentation with new products, but it also limits the freedom of resource allocation, due to financial reporting restrictions imposed by the wider group.

Tesco Personal Finance

Tesco Personal Finance (TPF) was investigated as a representative case of a joint venture type of organisation. TPF was set-up in 1997 between the Royal Bank of Scotland and Tesco supermarket20, giving Tesco a means of strategic expansion into Financial Services while opening opportunities for the profitable exploitation of existing IT and other infrastructure for RBS. In 2005, TPF reported pre-tax profits of £202m, a 26.5% increase from 200421. TPF plc. operates under the broader supermarket principle by playing an intermediary role of promotion and sales of products from a number of third parties such as Norwich Union and Green Flag car insurance; it furthermore provides basic Tesco-branded products such as loans, credit cards and savings accounts (7.1, §3, §21). Empirical data for the firm were obtained through two interviews with marketing and finance managers.

TPF appeared to inherit most of its cultural attributes from the retail world of Tesco rather than from the banking side of RBS; this is unsurprising, given that TPF’s operational structure relies on targeting existing supermarket customers, and that the infrastructure and systems rationale used has been directly provided by RBS’s existing operations, rather than being purpose-built. Therefore, technological decisions within TPF were minimal and restricted to incremental improvements rather than larger scale implementation (7.1, §53). Much of TPF’s technological resource was devoted to the Single Customer View project that aimed to provide integration of customer information from diverse databases to achieve a more directed and sophisticated sales service (7.1, §3, §85; 7.2, §27). The project was underway during the investigation period and was used as reference for examining the organisation’s TIDM processes.

As a joint venture, TPF’s decision-making function was composed of members of both firms’ Boards (RBS and Tesco) with the banking partner’s representation dominated by

accounting experts (7.1, §37, §41, §61; 7.2, §31). This characteristic contributed to a strongly quantitative orientation of TIDM (7.2, §33, §37). In addition, again due to its joint venture status, TPF technological decisions were restricted by centrally prescribed ROI benchmarks that often assumed the key role in promoting or rejecting technological projects (7.2, §31). The overall TIDM process, as reported by interviewees, greatly relied on traditional decision-making structures dominated by a 'silo mentality' that is possibly driven by the fact that TPF Board is composed of three Directors from each of the joint venture partners (7.1, §41). Decision-making was also seen to be highly political, especially with reference to how financial justification is used to serve interests (7.2, §31, §33).

According to the interviewees, professional expertise in TPF is clearly geared to the Banking and Finance side, apparently because of the nature of the firm's products. IT expertise was identified as a fast-changing area that can easily be outsourced, and thus is not considered pertinent (7.1, §57). On the other hand, it was recognised that Finance expertise needs to be combined with market-related and IT knowledge in order to enhance understanding of the longer-term benefits to come from Internet applications (7.1, §59). The overall picture of TPF, as provided through the empirical data, is that of a joint venture where TIDM is highly restricted by the financial requirements of its partners and where decisions at large are political to a great extent, and less about objective evaluation of options.

Goldfish Bank

Goldfish Bank was included in the sample as another representative case of joint venturing between banking and non-financial organisations. Goldfish was launched in December 2000 as a 70-30 partnership between Centrica, the utility provider and Lloyds TSB bank. The venture was initiated by setting up a credit card operation that would be fully manageable through the web; the Goldfish brand was acquired by HFC Financial Services and already featured 1m cardholders (9.1, §7). Development of a full scale Internet bank was based on the technological knowledge and resources of Evolve bank, a wholly-owned Lloyds TSB venture. Goldfish Bank reported net income of £18m in the first half of 2002, a 29% increase from the year before. The business proposition of Goldfish bank was investigated through two interviews, both providing a view from the Finance expert group position.

Concerning resident TIDM processes, interviewees suggested there was a "hand-in-hand" collaboration between Finance and other business areas as to promoting Internet Banking-related projects (9.2, §23). Despite that, the impression through the interviews was that the Finance function assumed a central determining role as to prioritisation, acceptance

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or rejection of projects (9.1, §28, §34), as opposed to a facilitating one; reportedly, Finance experts were “actually monitoring what the business is doing and reporting and controlling and acting as almost to please the investment decision takers” (9.2, §25), thus playing a large political role in TIDM; in the same spirit, decision-making was reported to be more of an act of belief, rather than a process following careful evaluation. Interestingly, that was viewed as an intermediate stage towards the maturing phase of the firm, where the role of Finance would turn “to more support for the business and making sure that the project is implemented on time, on cost budget” (9.2, §25). Similar attitudes were also recorded in pure play banks such as IF and Egg. The overall finance-led approach to TIDM was also reflected in the high importance given to economic metrics in the appraisal processes. This is visible in two ways: the dominance of financial measures in assessing the contribution of technological investments to the Group’s share price (9.2, §27) and the clear preference shown in decision-making to projects with short-term benefits (9.2, §17). At the same time, attempts within Finance to move to more sophisticated assessment of Internet Banking were not particularly strong; the belief reflected in interviews was that Internet Banking should not be seen differently from any other IT project (9.1, §34), while applying methodologies such as Real Options was considered an approach that might have undesirable effects to established processes due to its emphasis on detail (9.1, §38). Interview evidence, finally, suggests that, again in accordance with the established quantitative culture, intangible benefits were treated as guidelines for informing quantitative assumptions, as opposed to elements that can directly be quantified (9.2, §31).

The issues of expertise and knowledge management were only briefly addressed in the two interviews; as in other cases, the evolution of expertise was seen to reside with professionals closely located to the customer end, such as servicing, selling and retailing skills (9.2, §52). Traditional banking skills were seen as important as well for core operations, however no reference to IT skills was made. This is not surprising, considering (a) the fact that the core technologies for setting up Goldfish Bank were taken directly from Evolve and (b) that the culture of Goldfish largely stemmed from that of Centrica, an organisation with strong customer-centric culture. The overall picture of Goldfish Bank, as provided through the interviews, was of a joint venture that relies on a straightforward combination of the skills and strategic advantages of the parent organisations, where culture is highly customer-centric and where operational principles and strategic tactics are deeply rooted in the traditional Finance-driven banking approach to investment management.

**Société Generale**

Societe Generale (SG) was investigated as a representative case of non-retail, investment banks, with a view to addressing wider investment decisions on e-commerce and other IT projects. Its role was therefore ancillary to the core subject, and as such was briefly
addressed through a single interview with an IT expert with experience on technology strategy and e-commerce business propositions. The experience drawn on was that of developing trading platforms for internal use in the investment bank.

Interview data suggests that the nature of investment banking significantly drove technological decisions in that area. With regard to TIDM, one significant observation was that internal sponsoring of IT projects often happened in the absence of adequate knowledge of the business value of the implemented technology (8.1, §38); that may be seen as the outcome of both a silo approach to different functions in the bank as well as the nature of investment banking where technological investment decisions were necessarily quick and focused on short term benefits (8.1, §32). Along the same line of thinking, technological decisions were driven by a highly quantitative culture of the bank where “you have to be able to sort of justify or describe [ ] benefits with numbers” (8.1, §26). By the same token, “projects that don’t have very strong case in tangible numbers, they tend to sort of [get rejected], unless it’s like you have to do it to meet a certain regulation” (8.1, §28). The methodologies for assessing costs and benefits were, according to interview data, primarily based on the traditional DCF, while some investigation was carried out with a view to implementing Real Options Valuation. This came in as the proposition of external consultants, however, and it was not apparently followed through (8.1, §74, §76).

The overall traditional investment banking culture in SG encouraged power structures on the basis of business line silos, rather than expert groups (8.1, §4); at the same time, there was no evidence of a dominant expertise with regard to technological decisions. “[I]n terms of the power, the power is with whoever pays, in a way; whoever is sponsoring the project, which is usually the business line”. (8.1, §26) Expertise development was, furthermore, not seen as a point of attention within the bank; that was demonstrated by both the lack of PIR processes as well as the identified absence of Knowledge management structures to capture and reuse experiences in IT projects across the globe (8.1, §40).

**Abbey National - Cahoot**

Abbey National was looked at as a Financial Institution 24 that followed a dual strategy with regard to retail Internet Banking. That strategy consisted of the introduction of Abbey National branded Internet service and the launch of Cahoot, a pure-play Internet Bank in June 2000 25 that featured 650,000 customers in 2004 26. Cahoot was set-up as a totally separate venture from Abbey National’s Internet banking and services (10.1, §16). The case

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24 Abbey National has been a building society until 1989. It changed its name to Abbey in 2003 and became part of Grupo Santander in 2004.
of Abbey National was discussed through a single interview with a former member of the Strategy team, who also participated in the delivery of both Internet Banking propositions of the bank. Of these ventures, Cahoot was given more freedom to develop a start-up culture and thus move away from the traditional highly hierarchical structures of Abbey National.

With regard to established TIDM structures, interview evidence suggests that these were greatly driven by the short-term culture of the firm that “based on a quarterly basis to justify Internet banking” (10.1, §8) in financial terms. At the same time, however, financial evaluation was not seen as key; financial measures were used as purely supporting data for decisions that were being taken on a strategic basis; “it’s based on what competitors have done, and competitors move so we have to move and be a quick follower” (10.1, §8). It thus appears that while the Finance function enjoyed a powerful status in critically influencing decisions to promote or reject IT projects, its role was merely political as “the tools, if anything at all, would be secondary to justifying an investment or investment project.” (10.1, §85) In that sense, financial rigour apparently played a legitimating rather than evaluative role, where “NPV numbers for e-banking, for the separate e-banking, were manipulated to make it look positive” (10.1, §85). Thus, the overall picture described suggested that technological decisions were taken on a highly informal and purely political basis (10.1, §64).

Unlike that attitude, Abbey National is reportedly investigating the use of sophisticated techniques for assessing IT investments at the Technology Strategy level (10.1, §87); at the time of the interview, however, such efforts did not reflect established practice.

A significant characteristic of Internet Banking implementation in Abbey National was the reported lack of technology strategy, as demonstrated through the development of CRM systems in the absence of an underlying integrated channel or product management strategy (10.1, §72). This was additionally reflected by the absence of PIR processes with regard to Abbey National’s Internet Banking proposition (though not for Cahoot) (10.1, §50). PIR was seen rather as a ‘post-mortem’ tool to track failed projects, and a process for which overstretched resources should not be allocated (10.1, §64). In the same line of thinking the tasks of identification and measurement of costs and benefits were seen as separate and thus performed by different units –Strategy and Finance respectively – in a sequential silo-type manner where “just identification is done by the Strategy Department and if they identify the need they pass on the thing onto the Finance Department to put some numbers to it” (10.1, §68). The same lack of technology strategy focus may be seen as the source of the reduced attention to Knowledge Management in the firm, expressed through the lack of commitment at the higher executive levels (10.1, §101). This attitude was attributed to the short-term culture of Abbey, where “[w]hat really matters is if it actually serves the bottom line” (10.1, §105). Overall, Abbey National’s Internet Banking implementation reflects a follower strategy of a firm with little technological advantage, highly hierarchical structures and a strong political culture in decision-making.
**Conclusions**

This chapter provided a background account of both the setting of this inquiry and the financial institutions that were used as the case studies. To do that, it was divided into two parts. The first offered a broad view of the UK Internet Banking market at the time of the investigation and briefly discussed three categorisations for the firms' entry strategies to the sector. That account not only described the landscape of UK Internet Banking, but also addressed the different strategic alternatives for entry and underlined their relevance to respective TIDM attitudes. The second part was comprised of a focused review of the ten financial institutions from which the interviewees came. This discussion drew mainly on the reported TIDM processes and the informal practice in technological decisions, as well as the evolution of expertise around IT and Internet Banking in particular.

The main conclusions drawn from this chapter refer to (1) the role of the overall strategic orientation of organisations for TIDM, (2) the relationship between expertise and technological decision-making and (3) the effects of firms' particular corporate cultures on how technological value is viewed. From the outset, entry mode strategies reflect attitudes to technological decisions: historical and empirical evidence suggests that standalone Internet banks (such as Egg, IF and The One account) have flatter decision-making structures for technological investments; this is partly due to the pressing need for quick and effective decisions in such organisations, their technology-driven culture and their small size that allows flexible processes to prevail over the heavier hierarchical ones characterising incumbent banks. This is also true across all incumbent, related and unrelated entrants, wherever a separate-branded firm was developed to offer Internet Banking services (see Table 5.4). Similarly, TIDM in standalone banks appears to be more strategy-driven and less strictly based on rules of economic assessment. Yet again, such attitudes were found to be correlated to the lower reliance of that type of bank on traditional banking experts, largely populating the higher management layers of large incumbent banks. That is unsurprising since the setup of new Internet Banks by incumbents was in most cases justified by a need to depart from the traditional and highly hierarchical cultures of parent organisations. The overall 'softer' view on technological investments was linked with two idiosyncrasies of start-up Internet banks: (1) the typical churning of higher management employees across different operational roles; and (2) the establishment of IT-savvy managers in key organic positions. Where used, the former practice contributed to equipping managers with holistic views of the business models, rather than reinforcing their original expertise-based perceptions on Internet Banking. Similarly, the assignment of executives with IT backgrounds in leading roles, cross-fertilised the traditional banking expertise coming from the parent institutions, with concepts that were newer to the financial services world, but which were also seen pertinent for successful implementations of the new business models.
PART 3

Chapter 6: Research Approaches to TIDM: The Investment Valuation Toolkit

Introduction: the Process – Practice Dichotomy

Chapters 4 and 5 provided a picture of the UK banking landscape. An historical account was made in Chapter 4, with particular focus on the evolution of banking technology, and the accompanying perceptions of how this technology should be appraised. Particular attention was given to professional expertise and its evolution in UK banking, particularly with regard to its subtle but important relationship with established perceptions on technological value. In Chapter 5, the discussion turned to Internet Banking, providing a strategic view of competitors and their technology strategies. That review linked strategic entry modes to observed patterns of TIDM for Internet Banking. Finally, the chapter provided an account of the Internet Banking background of the firms that were sources of the empirical material, with particular reference to their TIDM structures and expertise development.

With the present chapter, the core discussion of the practical problem of TIDM begins. Together with Chapter 7, it provides an account of the different approaches to the problem used by Observers and Practitioners. It is suggested that the stance of Observers, is informed by decision models developed through academic or industry research. These
formal\textsuperscript{1} models are widely represented in the research literature and are referred to here with the term \textit{Research approaches}. These are the subject of the present chapter. Practitioners, i.e. professionals who directly participate in making technological decisions, are discussed in Chapter 7. Their involvement in TIDM is visible in two forms: one, as a set of formal processes that prescribe how TIDM should be done and, two, as the actual established practice in making decisions.

The disparity between prescribed process and established practice is at the core of this thesis. The three activities linked to TIDM - one coming from the Observers' space and the other two from the world of Practitioners - are interconnected through the relationship described in Figure 6.1. The figure also represents the demarcation between \textit{process}, established in both Observers and Practitioners spaces, and \textit{practice}, constituting the actual use of processes by Practitioners to facilitate decision-making.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure61.png}
\caption{The generic model of TIDM in the Observer and Practitioner space.}
\end{figure}

In discussing the \textit{research approaches} to TIDM, this chapter begins by briefly addressing the question of whether technological investment is quantitatively definable and, hence, whether assessment of technologies can be normatively achieved. This introduces a discussion of the different, and often contradictory, research approaches of different academic and practitioner viewpoints. Three broad approaches are discussed: the Finance and Accounting approach; the Information Systems/Information Technology (IS/IT) approach; and the Technology Assessment/Technology Policy (TA/TP) approach. This

\textsuperscript{1} The term is used to denote the 'officially constituted or organised, as opposed to spontaneously developed' (\textit{Online Encarta Dictionary of English}). It has no connotation to the use of symbolic mathematical expression.
broad taxonomy was chosen to reflect distinctive angles of different viewpoints to the problem. The rationales and points of conflict between the bodies of knowledge that support the three research approaches are discussed first. The chapter then focuses on the investment appraisal techniques and processes used in IT valuation, with particular reference to UK banking. At the end of the chapter the need for an integrated approach to TIDM is proposed in conclusion.

The Ambiguity of Normative Quantitative Assessment of Technology

The core problem of technological assessment starts from the debate on whether the contribution of technology can be quantitatively determined in the fullness of its dimensions, or whether our present inability to achieve its full measurement is merely the result of our limited knowledge on how to quantify its quantitatively-undetermined facets. This inability may be because of the high complexity and variety of technology as a notion. It is also due to the particularities and contextual character of technological implementation that is a highly contingent and complex organisational process (Fleck, 1992). The division of viewpoints between immeasurability, on the one hand, and inadequacy of known measures, on the other, represents the ambiguity of normative quantitative assessment. This is the proposition that we cannot be certain whether a complete or near-complete measure of technological value can exist. This is because of the different facets of uncertainty that interfere with measurement efforts. Four such facets are identified here as key contributors to the ambiguity problem: (1) the inherent uncertainty in predicting the technology's future outcomes, (2) uncertainty in the process of implementation (Fleck et al., 1990), (3) the ambiguity of choice of suitable measures for technological value and (4) uncertainty in predicting market trends and conditions (also known as market uncertainty). The broad concept is illustrated in Figure 6.1.

As illustrated in Figure 6.2, the first two facets of uncertainty mainly imply that technological value is not fully measurable, regardless of how much resource is made available to assess it. The argument for that stance is that normative measures require the ability to ascertain deterministic or probabilistic quantities. Such elements are absent in technological implementation, because uncertainty is inherently unspecifiable in these terms. Similarly, the view that technological value can be measured, but that there is

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2 Largely, attempts to solve the 'IT Productivity Paradox' are geared to addressing such limitations and thus achieving full accountability of that contribution (Nissen, 1994; Harris 2001).
3 In the diagram, the two latter facets of uncertainty are not associated with the immeasurability viewpoint because their importance is minimal compared to two former facets: even if market
insufficient knowledge available for doing so, is supported by the two latter facets of uncertainty, i.e. uncertainty on selecting suitable measures and uncertainty about the market. According to this approach the problem is resolvable by improving assessment approaches and techniques and thus reducing ambiguity. In this view, predicting market trends is seen as a matter of processing capacity, increased knowledge and strategic capability, all of which are subject to skill improvement and resource availability.

![Diagram of Technological Investment Valuation](image)

**Figure 6.2**: The lower-level dichotomy on the *ambiguity of normative quantitative assessment*; the dichotomy has strong connotations to the notion of *uncertainty*.

At a more profound level, the same problem of technology measurement is found in the dichotomy between two viewpoints termed 'improvable measurement', and 'perception-contingent measurement': Of these, the former represents the opinion that the techniques currently used for assessing technologies are, for various reasons, inadequate. Accordingly, suitable techniques should be devised, either to achieve the desired levels of accuracy of measurement, or to account for aspects that the older ones failed to. This is an approach largely advocating a solution through improvement. According to that viewpoint, there exists a near-perfect measure of value for a particular technology in a particular context and our attempts are geared to achieving it.

On the other hand, the *perception-contingent measurement* viewpoint represents the opinion that the problem is not about improving valuation methods, but rather about different expert groups' perceptions on how technology should be evaluated: different research strands approach their assessment of technology with different goals in mind.

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conditions were predictable and choice of method was certain, technological value would still be impossible to measure through deterministic or probabilistic means.
Accordingly, many measures of technological value exist, where each one develops and evolves within a particular frame of reference. The two paradigms are illustrated in Fig. 6.3. This latter approach is also what the Actor-based IGT framework proposes.

Figure 6.3: The two measurement paradigms; ‘improvable measurement’ exists within each research strand or discipline, advocating that one best measure exists that can be reached through improvement of the methodologies and tools. ‘Perception contingent measurement’ is disclosed when we look at the disciplines externally: each one optimises its measures of technological value on the basis of its internal perception of what technological value is.

Figure 6.3 depicts the dimensions of the TIDM problem discussed above, with reference to the three research strands used in this analysis. These research approaches to TIDM operate under the assumption of ‘improvable measurement’. They are grounded in different academic disciplines and address different interests. As a result, they all accommodate the particular perceptions shared by their proponents, while none of them recognises the existence of such perceptions⁴. Therefore, each attempts to incrementally

⁴ This is because, as discussed in chapter 2, each discipline is a closed value system that offers complete explanations within its boundaries. The viewpoint of ‘perception-contingent measurement’ by definition falls outside the scope of each approach.
enhance the technology assessment methods within its own remit. Each sees technological value as an entity that can be ascertained by quantitative or qualitative measures that allow meaningful comparisons between competing technologies. As a result, proponents of each approach adopt methodologies that accommodate their own understanding of what technological value is. By contrast, the Actor-based IGT approach supports 'perception-contingent measurement', in which Actors, such as the Finance, IS/IT and TAITP scholars are distinguished by different agendas, have different interests and viewpoints on the TIDM problem and, thus, treat it in different manners. Their approaches are disparate, not because they disagree as to the correctness of the methods but because they look at TIDM through different eyes. They evolve along different dimensions and cannot be complemented or otherwise synthesised in any way, even when they claim to do so.

The wider problem of technological investment valuation presented here epitomises the debate on the value of technology. The origins of this debate lie in a multitude of academic disciplines and their perceptions about technological value. The perceptions addressed in Fig. 6.3 are discussed in the sections to follow, by looking at the approaches to technology valuation proposed in academic literature.

The remainder of this chapter provides an analytical account of the different viewpoints on valuation of IT investments. It begins with a review of the established research approaches to TIDM that the three chosen research strands propose. The discussion then presents the conflicting views and the dynamics of their disagreement around the assessment of uncertainty. The chapter then focuses on a review of methods for investment appraisal of IT.

Technology Valuation & Assessment: proposed approaches and points of conflict

This section discusses the approaches to TIDM that prevail in contemporary practices of technology evaluation in banking and elsewhere. It begins by underlying the fact that the specificities of IT have become the basis of the debate over the suitability of existing approaches to its economic appraisal (Hochstrasser & Griffiths, 1993; Bennett et al., 1988). As a result of that scepticism, experts propose the need for adjusting or replacing techniques for IT valuation (Irani et al., 1997; Hinton & Kaye, 1996; Irani, 2002).

The main discussion is an account of the stances that developed, over the past 20 years or so, within different academic, policy and industry fields, around the evaluation of IT.

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5 This is often attempted by adapting methods from other research strands to create new models. This is a typical strategy that scholars apply to deal with criticism coming from outside their discipline. An example is that of Critical Accounting (Laughlin, 1999; Galhoffer and Haslam, 1997)
Three such research strands for evaluating IT are used here: the Finance & Accounting approach; the IS/IT approach; and the Technology Policy–Technology Assessment (TA) approach. Their rationales and points of conflict are discussed in detail. This discussion provides context for understanding the established approaches to technological investment valuation and the sources that drive them. It also addresses the dynamics on which academic research strands developed their stances on TIDM on the grounds of their disparate interests, motivations and historical trajectories.

IT’s characteristics are often held responsible for many of the ambiguities in IT valuation (Farbey et al. 1992; Silk, 1990; Hinton and Kaye, 1996). As a result, many of these are reported as key factors in the ongoing discussion about the so-called IT Productivity Paradox (ITPP). IT systems are appraised on their ability to deliver information management. Although many of these attributes are subjected to measurement, others, such as productivity, quality and reliability are less measurable, introducing ambiguities as to their assessment. Measuring the strategic value of information is notoriously hard (van Irsel et al., 1992; Ives and Learmonth, 1984). That difficulty is exacerbated by the fact that the value of information is ultimately subjective (Silk, 1990).

Tendencies to look at technology - and IT in particular - as standalone capital investments have often been considered responsible for the lack of effective appraisal (Lefley, 1997; Nissen, 1994; Hinton and Kaye, 1996). IT applications are primarily of a shared nature (Weill, 1993). IT is furthermore, by definition, a network technology. It is flexible with regard to its potential use and exhibits reduced demand in tangible resources for expansion, volume production and customisation because it enjoys network economies. IT systems can be theoretically expanded infinitely by branching out new subsystems to accommodate subdivisions of the firm. In addition, IT has the characteristic of spillover: the effects of IT are often felt in divisions where they were not meant to have any impact at all. It offers the potential for organising, ordering, processing, presenting and communicating information to serve specific purposes, but use of this information cannot be restricted to the intended purposes only. Thus IT is hard to formalise by capturing its functions, effects and operations into standard metrics. Much of IT’s value is defined by the organisation’s idiosyncrasies. It is thus highly uncertain with regard to how it is implemented, at what cost and what its delivered outcomes are. As a final point, the performance and usefulness of an IT system depends directly on users’ acceptance of the system (Allingham and O’Connor, 1992). IT may only deliver results when the organisation recognises particular uses for it and employs it to achieve specific goals. In that respect, an IT system is given life only by its users and cannot deliver results by itself. As these points illustrate, appraising IT can have different results depending on the aims of the appraisal function and on the aims of the expert groups who define these aims. This thesis supports that these different aims are reflected in the agendas of research strands that deal with TIDM. This is discussed in the sections that follow.
Finance & Accounting, IS/IT and Technology Policy: alternative approaches to TIDM

The discussion of the nature of IT provided the basis for understanding the rationales of the different approaches to its assessment. IT investment valuation has historically been the subject of both the disciplines that traditionally dealt with the valuation of assets, and those that dealt with the implementation of technology. Their different understandings of IT and the research agendas they subscribe to have led to different stances towards IT investment valuation. These different understandings are broadly reflected by the three research strands discussed here as alternative rather than complementary.

The most recent point of reference between the assessment of technology and the subject of investment valuation is the 'IT Productivity Paradox'; a notion that was widely addressed by academics and practitioners from different backgrounds (see for instance Dehning et al, 2004; Diewert & Fox, 1999; Mukhopadhyah et al, 1997; Willcox & Lester, 1996; Harris, 2001). The literature has long dealt with measuring the economic value of technology, with economists such as Solow (1957), Schumpeter (1980) and scholars of developmental economics attempting to account for, and ultimately quantify, the contribution of technology to production. Among such efforts, Knight (1965) introduced and formalised the notion of uncertainty, on which our inability to forecast future outcomes is often based. Uncertainty has since enjoyed the treatment of Mathematical Economics, Bayesian statistics and other disciplines, which viewed it as a natural quantifiable entity. Measuring uncertainty was seen as a tool for quantitative assessment of contributions unexplained by other known measures (Laffont, 1989). Uncertainty in technology, however, has also been addressed by disciplines such as Science & Technology Studies (STS) which, conversely, question its measurability and propose that uncertainty can only be accounted for through the constructs of strategy, policy, decision-making and, ultimately, implementation (Freeman & Soete, 1997).

The importance of the new role of Information Technology as a determinant of corporate performance has in recent years increased the demand for firms to evaluate\(^6\) and justify their IT decisions. While the main reason for this appears to be the capital-intensive character of IT, a number of studies report that a large percentage of capital investment in IT is wasted (Willcocks and Lester, 1993; Hochstrasser and Griffiths, 1990) and therefore IT systems' appraisal should be viewed with greater urgency.

\(^6\) According to Ballantine and Stray (1998), the terms 'evaluation' and 'appraisal' are used in the Information Systems (IS) literature interchangeably. However the authors link 'appraisal' to the \textit{ex ante} consideration of IS investment, while using 'evaluation' to signify a process that may be done continuously during project development.
The definitions of investment itself and the evolution of the discipline of Finance around investment fundamentals, suggest a number of established academic and corporate attitudes as to what the appraisal process for technology should seek and how it should be made. The fact that the concept of investment as a distinct function of a firm was first explored by Finance specialists has historically affected perceptions on what investment is and who should be responsible for it. Academic textbooks of Finance describe and treat investment as a function whose outcomes are explicitly measurable in terms of monetary returns (Brealey and Myers, 1996). Such returns are conventionally regarded as cash inflows and outflows around a period of time (Weston and Copeland, 1991; Mensah & Miranti, 1989), whereas no explicit treatment appears to exist with regard to long-term performance (Dos Santos, 1994; Ashford et al., 1988), an attribute advocated as the key source of technological value (Primrose et al., 1985).

As a consequence of this early definition, investment appraisal was naturally thought of as an *ex ante* financial examination that evaluates pecuniary benefits and disadvantages of investment (Ashford et al., 1988). It can be argued that this finance-driven identity has had several impacts on the assumptions surrounding investment, as well as the methods used for its assessment.

First, the aforementioned treatment implies that only the benefits or disadvantages that translate into a quantifiable value can and should be taken into account when appraising investments. This line of thinking is closely linked with the idea that only quantifiable items can be inserted in cash flow formulas and translate to positive or negative returns (Kaplan and Norton, 1992).

This quantitative character has had an additional impact on corporate practice. Being a financial process, the decision to invest or not in a project has been nearly exclusively the domain of finance experts in the firm. The impact of this is twofold: First, it has reinforced the dominance of a powerful corporate elite represented by finance and accounting experts, who have a strong say in accepting or rejecting investment propositions, regardless of their nature. Second, with the empowerment of Finance specialists, the Finance function itself was established as a separate and in many instances isolated component of the firm, acting as a bottleneck for promoting – or rejecting - investment projects.

A third impact of the finance-based treatment of investment appraisal has been the attitudinal guidance it offers to managers involved in project proposals. The empowerment of Finance expertise and the consequent tendency to use the finance function as a means of filtering out inefficient projects has meant managers often tend to focus on the shorter-term.

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7 Short-termism in project selection is observed by different authors. Ashford et al. (1988) asserts that managers are less likely to promote projects bearing a lifetime in excess of the time spent by them in their posts. Similarly Narayanan (1985) remarks on the tendency of managers to support projects with early cash flows as a means of improving their remunerations.
quantifiable benefits of projects rather than the long term (and occasionally more valuable) ones (Lefley, 1996). Such attitudes, it is suggested, are held on the ground that it is cash inflow generation rather than long-term value that is visible to the owners and shareholders of the firm.

Alternative attitudes to appraising technological investments are widely discussed in the STS and Technology Policy literatures, dating back to well before the 1990s, with researchers attempting to explain the economics of technological change. While classical economists largely disregarded the importance of technical change in explaining economic growth, and saw no need to study it (Saviotti, 1998), later neo-classicists\(^8\) attempted to measure technical change by deducing the contribution of investment growth from total observed growth. In this regard, the economic effects of technical change were calculated as a residual\(^9\) that could not be explained by capital and labour (Coombs et al., 1987). Later economic theories of growth, however, supported the contribution of technical change to the increase of growth factors rather than growth quantities and recognised the importance of investment (in physical, R&D, human and public capital) in the relationship between technical change and economic growth (Freeman, 1997).

A large body of Science and Technology Studies (STS) literature also linked investment in technology with the nature of innovation. This was mainly expressed through empirical studies which sought to define the determinants of successful technological innovation, and which created a new observational base for later theoretical conceptions (Saviotti, 1998). In an overview of such empirical studies, Freeman (1997) outlines some of the characteristics of successful innovation and underlines the importance of a number of determining factors such as:

- In-house, as opposed to outsourced, R&D and its professionalisation.
- The linkage of the innovating firm to sources of basic research such as universities and the state.
- Patents\(^10\), as a source of competitive market power.
- The firm size, in terms of its ability to finance R&D for long periods.
- Involvement and education of the potential users of the technology.
- Creation of a knowledge base and expertise\(^11\) within the firm.

\(^8\) According to Saviotti (1998) the first neo-classical economist who tried to measure the contribution of technical change to growth was Solow (1957).

\(^9\) Freeman points out that in Solow’s model technical progress is not seen as a production factor like capital and labour. ‘The assumption of constant returns in the production function would mean that the marginal returns of capital to technology would have to be decreasing, preventing them from contributing to growth in the long run unless additional specific assumptions are introduced’ (Freeman, 1997: p. 325).

\(^10\) Patents were first used to measure the innovative activity of firms by Schmookler (1966) and later by Walsh (1984).

\(^11\) The roles of knowledge-generating activities and expertise are detailed in Fleck (1998) and Faulkner (1998).
The fact that the technology and innovation literature widely treats these factors as determinants of innovation success appears to be inherently linked to the role of uncertainty as a characteristic of innovation. A number of studies recognise uncertainty as a structural element of the implementation\textsuperscript{12} process (Fleck, 1984; Bessant, 1985; Swanson, 1988) and provide a taxonomy of uncertainty, featuring (1) \textit{technological} (relating to the deployment of technology in real systems), (2) \textit{market} (relevant to the prediction of market trends), (3) \textit{developmental} (i.e. whether a system can be developed under time and budgetary constraints) and (4) \textit{structural} (relating to the structure of the industry) uncertainty\textsuperscript{13} (Fincham et al., 1994). The same literature considers investment in R&D to be a major source for augmenting a firm’s stock of technological knowledge (Freeman, 1997), giving rise to the notion of ‘intangible investment’. Such treatment in itself introduces the necessity for appraisal methods for new technology projects to consider non-monetary dimensions of the investment process.

\section*{The Finance and Accounting view of IT Investment Appraisal}

The first of the three chosen research approaches is that of Finance and Accounting. Although this term refers to an extremely broad class of disciplines, it is used in the context of this work to mean those academic research strands that focus on the quantitatively measurable variables of economic activity. The contribution of Finance and Accounting to technological investment valuation is largely based on developing models for quantification and measurement of technologies’ economic contribution.

The traditional perceptions of investment appraisal mentioned earlier can be seen largely as the result of Finance and Accounting disciplines’ established role in academic and corporate life for over a century (Applegate et al., 1999), and with the emergence of IS/IT in the past four decades (Benbasat and Weber, 1996), it is unsurprising that finance experts have typically treated investment in IT as no different to other types of capital investments (Ballantine and Stray, 1998): while finance textbooks discuss the factors of project performance evaluation at length (Weston and Copeland, 1991; Brealey and Myers, 1996), they say little about assessing the strategic and other non-quantified benefits or pitfalls of IT projects.

\begin{itemize}
  \item Authors in technology and innovation literature treat cost and other monetary parameters, as components in a complex constellation of determinants in the implementation process (Fincham et al., 1994; Voss, 1988; Leonard-Barton and Krauss, 1985; Swanson, 1988).
  \item An additional attempt to taxonomise uncertainty is made in the IS/IT literature by Lint and Pennings (1999) where the distinction between micro (controllable) and macro (non-controllable) uncertainty is made. However the authors treat uncertainty in its negative connotation only and use standard deviation as a means of formalising its measure (p. 486).
\end{itemize}
The Finance literature focuses on the maximisation of the firm’s shareholder wealth as the aim of investment decisions. In this context, capital budgeting theory has focused on devising appraisal methods that are consistent with that aim (Lumby, 1981). As it is dividends and the market value of a company’s stock that reflect shareholder wealth, it is implied that markets measure the overall profit or loss incurred by a company’s portfolio of projects, rather than the revenues or losses from any individual project it is undertaking. On these grounds, measuring aggregate revenues from projects calls for the establishment of common appraisal methods so as to (1) ensure that investment decisions are consistent with each other, (2) provide comparable quantitative measures for each project, which can demonstrate a short-term positive or negative aggregate value for the company’s portfolio of projects and (3) allow for full consideration of costs and monetary benefits from projects in the company’s financial statements. This need for appraisal consistency has led to the establishment of quantitative financial methods as standard tools for appraising all kinds of company investments, irrespective of their strategic or other non-quantifiable attributes.

The role of stock markets as mechanisms for rewarding efficient performers further imposes a quantitative approach on to the appraisal of investments: since the elements that stock markets translate into contributions to share price have primarily quantitative connotations, it appears that firms are more likely to focus on the usage of standardised quantifiable measures of appraisal for their projects, which can then be disclosed in financial statements. Conversely, it could be argued that the use of formal appraisal techniques based on strategic or other non-quantitative attributes could hardly be convenient for stock markets to analyse and translate.

Furthermore, the ways by which project uncertainty is dealt with in Finance suggests that there is no explicit treatment of IT in investment appraisal. As regards the distinction between uncertainty and risk, Finance scholars widely recognise the existence of uncertainty in capital investment decisions (see Brealey and Myers, 1996; Weston and Copeland, 1991; Brigham and Gapenski, 1997); however they do not consider it as a direct constraint in taking decisions: managers will always have to decide to undertake a project or not, irrespective of how uncertain it may be. The Finance literature adopts the measurement of project risk as the closest proxy to account for uncertainty, and subsequently some authors use the terms risk and uncertainty interchangeably.

However, scholars outside the Finance and Accounting field do provide a distinction between uncertainty and risk. Risk is related to instances where there is a clearly defined

14 Of course this does not mean that projects are not treated individually in finance theory. Capital budgeting refers to the development of a number of appraisal tools (Payback, Discounted Payback, NPV, IRR, ARR and others) which aim at assessing individual projects and facilitating selection among different alternative investment propositions (Brigham and Gapenski, 1997; Copeland and Weston, 1992).

15 This does not imply that stock markets remain indifferent to successful technological implementation. However, as often witnessed in past research (Primrose, 1991; Hayes and Garvin, 1982), success in IT implementation is only visible long after completion and its contribution to financial gains is ambiguous.
number of possible outcomes whose probabilities are known (Van Horne, 1966) while uncertainty suggests an infinite number of future alternatives on grounds that cannot be defined at all (Mowery and Rosenberg, 1979). Although risk results from uncertainty of outcome (Sarper, 1993), it is seen as the consequence of taking an action under uncertainty, rather than a measure for it. Consequently, while financial methods of investment appraisal may provide for risk adjustments, the cash flows used will themselves contain elements of uncertainty (Lefley, 1997).

The Finance literature also limits the definition of uncertainty itself: Investment risk in Finance is linked to the possibility that an unfavourable event will occur and is consequently defined as the probability of earning less than the expected return (Brigham and Gapenski, 1997; Lofthouse, 1994). The implication of this definition is that since risk assessment is used to provide against uncertain but unfavourable outcomes of a project, uncertainty is viewed in its negative aspect only and therefore uncertain benefits are totally neglected. In this sense it can be argued that the finance literature dismisses possible gains that cannot be appropriately forecasted.

In concluding, it may be asserted that the attributes assigned to project investment within the finance literature appear to limit the suitability of financial methods for appraising technology and IT related projects. This assertion will be reinforced in the following section where perceptions of IT investment appraisal as recorded in the IS/IT literature are examined.

The IS/IT view of IT Investment Appraisal

What is known in the academic literature as IS/IT is the discipline concerned with the development, use, application and influence of information systems (Hirschheim et al., 1995). The term ‘information systems’ denotes ‘an integrated set of components for collecting, storing, processing, and communicating information’. It comprises people, machines, and methods organised to collect, process and disseminate data and represent user information. Historically IS/IT has developed from practitioners of information systems, largely coming from Computer Science and Software Engineering. IS/IT is drawing on a number of disciplines such as management and cognitive science, organisational science, strategy and economics (Benbasat & Weber, 1996). Because of its subject matter, IS/IT is more grounded in practitioner methods and the progress in the practice of managing information systems (Robey, 1996), than in purely disciplinary foundations.

16 Conversely, the IS/IT literature pays significant attention to the positive side of uncertainty and treats ‘unidentified’ benefits as a major source of value for IT systems (Ward, 1994; Dos Santos, 1994; Renkema, 2000)

Established attitudes in the area of IS/IT appear to result from the well documented history of unsuccessful projects of IT implementation, which reinforces the view that whereas investment levels on IT infrastructure continue to rise, the economic data provide no clear view as to the contribution of IT to firms' performance\textsuperscript{18} (Renkema, 2000). The fact that investment in new technology in general - and IT in particular - is faced with the problem of unforeseen returns and benefits, leads to the assertion that IT should be treated explicitly in the investment appraisal process (Ballantine and Stray, 1998).

A survey of the IS/IT literature indicates a view of investment appraisal radically different from that found within the Finance and Accounting disciplines. While the latter propose a homogeneous treatment of all investments to maximise the firm's shareholders' wealth, IS/IT proponents recommend different purposes in appraising IT-related investment. Farbey et al. (1992) suggest four objectives in IS/IT appraisal:

- justification of investments,
- decision between competing projects,
- control over expenditure, benefits and the development and implementation of projects and
- development of a learning device for improving future investment appraisals.

Additionally, Ballantine and Stray (1998), in reviewing older findings, identify three further objectives:

- to gain information for project planning,
- to ensure systems continue to perform well, and
- to enable decisions concerning expansion, improvement and postponement of projects.

Renkema (2000), addressing issues of corporate decision-making, highlights the importance of investment appraisal for:

- informing stakeholders of the consequences of a decision
- committing stakeholders to the route to be followed
- creating a shared, value-focused view of an investment amongst stakeholders

Finally, Silk (1990) and Weil & Olson (1989) suggest that quantification of IS/IT systems should concentrate on three generic benefits: efficiency, effectiveness and competitive edge. They stress that while it is theoretically possible to assess these benefits through conventional capital budgeting techniques, such as Return on Assets (ROA), cost savings and other measures of revenue growth, this has in practice proved problematic (Farbey et al., 1992).

\textsuperscript{18} This is also known in the literature as the 'IT Productivity Paradox'. The concept of Productivity Paradox was first introduced by Solow who 'pointed out that although computers could be seen everywhere, the actual measured productivity gains from their use appeared to be very small or even non-existent' (Freeman, 1997, p. 330).
In reviewing the reasons and objectives of IS/IT appraisal, one observes the significance of the strategic rather than monetary value awarded to IS/IT projects. In contrast with the Finance and Accounting approach to IT investment, the IS/IT literature focuses on assessing the contribution of IT to a firm’s value rather than to its shareholders’ wealth.

The strategic impact of IT investment is well illustrated by Dos Santos (1994) who underlines the enabling capabilities of such investments to provide increasing returns through the development of new products, and to reinforce a firm’s existing competitive advantage. The significance of time in IT investment is further stressed in the literature in a twofold manner: (i) the ‘time-to-imitation’ concept, i.e. the effective usage of strategic IT investment to disallow competitors to quickly develop similar systems (Feeny and Ives, 1990) and (ii) timing as a determinant for allocating resources that are not easily available to others (Lint and Pennings, 1999).

The IS/IT literature further explores a non-monetary perception of IT investment through the notion of the infrastructural character of Information Technology. While the word ‘infrastructure’ in IT has traditionally carried the narrow technical meaning of centralised computing facilities (Renkema, 1998), newer notions support a broader context where the tangible technical element of Information Systems forms a facilitative platform for the management of a firm’s intangible assets like information and knowledge. Such notions additionally underline the shared nature of the so called ‘information infrastructure’ among different business units (Weill, 1993) and subsequently the necessity for coordination of IT investment across functions within the firm.

In conclusion, the viewpoint adopted by IS/IT academics and practitioners is fundamentally different from the traditional Finance and Accounting perspective on IT investment. Newly introduced aspects in IT, such as the value of information, the shared and coordinated nature of information infrastructures and the value of knowledge assets call for IS/IT appraisal techniques that incorporate these dimensions and their indirect contribution to a firm’s value. Most importantly, the transformational effect of IT in introducing change as a continuous (as opposed to discrete) attribute of implementing organisations supports the opinion that IS/IT investment should not be treated with conventional techniques of capital budgeting.

However, the contention – shared among IS/IT academics and practitioners - that financial methods largely fail to adequately explain IT’s particularities, does not imply that they are unusable in such instances, but rather that the contribution of strategic and other qualitative measures are necessary for effectively appraising IS/IT projects. The debate on the the proposed ways for dealing with IT takes a distinctively different turn when looked at from the viewpoint of Technology Policy and Technology Assessment (TP/TA). This third research strand is briefly discussed in the next few paragraphs.
Technology Policy and Technology Assessment (TP/TA)

Technology Assessment (TA) refers to the study and evaluation of new technologies; it is primarily grounded on the conviction that technologies by definition cannot be free of ethical implications. TA is future-oriented and considers its approach to be an interdisciplinary attempt to solve existing problems and prevent against the misuse of new technologies. Unlike the approaches discussed above, Technology Policy and, more recently, Technology Assessment provides treatments that are centred on the social and political implications of technology, rather than its economic measurement (Kasper, 1972, p.4). Technology Assessment proposes the valuation of technology's economic dimensions for a variety of purposes, largely relevant to the role of the state in technology and innovation policy (Morgall, 1991, pp. 23-24).

Technology Assessment (henceforth TA) grew out of post-war efforts for policy formulation, mainly in the US (Cruz-Castro & Sanz-Menendez, 2005), where the necessity for a detailed account of technological effects prevailed (Kidd, 1972, p. 124). Its growth coincided with the establishment of the paradigm of detailed quantification which accompanied 'systems approaches' to socio-economic and political issues. As such, the likes of Systems Theory, Cybernetics, Operations Research and other academic branches contributed to the evolution of TA methodologies (Liao, 2005).

TA adopts a rather minimalist attitude towards precise measurement of the economic value of technology to a firm. This is for two reasons: first, TA is not interested in the accurate measurement of economic benefit to the private firm. Such interest would directly conflict its social character and clash with the state's native role in assessing the unexpected consequences of technologies in society. Second, due to the role of TA, its proponents consistently supported a qualitative perception of the value of technology that is centred on social and political aspects (Jasanoff, 1990), in contrast to the purely economic and quantitative stance of investment valuation. Interestingly, the adopted stance of TA has occasionally been viewed as a measure against the accusations of partisan assessment as a 'disease' of TA (Morgall, 1991; p. 77)

TA has been often cited as the field that gave rise to important methodologies for appraisal of economic benefits of new technologies (OECD, 1971). The methods of CBA (Cost-benefit analysis) and CEA (Cost-effectiveness analysis) are largely derived from TA. Unlike their later use for financial assessment, CBA and CEA were originally developed to address the broader impacts of technology (Morgall, 1991). Naturally, in this mode of use, economic measurement had a different, more conventional, role as one of the assessed

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19 The political dimensions of assessing the value of introducing technologies have been documented in the literature of TA, Technology Policy and STS quite extensively (Morgall, 1991; Winner, 1999; McKenzie & Wajcman, 1999; Jasanoff, 1990; Coates, 2001 etc.). The broad problematic of it is based on the assignment of monetary value to intangible entities such as social well-being and inclusion or even human life.
components. Other than these techniques, the TA literature proposes a quite extensive list of methodologies used to provide a holistic approach to technology. These are summarised in the table below.

<table>
<thead>
<tr>
<th>Method</th>
<th>Question it addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost-Benefit Analysis (CBA)</td>
<td>Does the introduction of the technology pay-off?</td>
</tr>
<tr>
<td>Cost-Effectiveness Analysis (CEA)</td>
<td>Which is the most effective technology using the given resources?</td>
</tr>
<tr>
<td>Systems Analysis</td>
<td>How and why does the system as a whole function as it does?</td>
</tr>
<tr>
<td>Risk Assessment</td>
<td>What is the risk of introducing this technology? Is it worth taking?</td>
</tr>
<tr>
<td>Controlled Clinical Trials (CCTs)</td>
<td>Does the technique have an effect that can be measured?</td>
</tr>
<tr>
<td>Delphi technique</td>
<td>What do the experts predict the future consequences of the technology to be?</td>
</tr>
<tr>
<td>Consensus</td>
<td>What is the status of expert knowledge and the opinion of the interested parties with regard to this technology?</td>
</tr>
<tr>
<td>Public enquiries</td>
<td>What does the public think about this technology?</td>
</tr>
<tr>
<td>Social experiments</td>
<td>How can we develop social organisation and learn ways to work with this technology?</td>
</tr>
<tr>
<td>Future workshops</td>
<td>How can democratic social action be generated in relation to new technology?</td>
</tr>
</tbody>
</table>

Table 6.1: Overview of TA methods [adapted from Morgall, 1991, p. 66]

Notwithstanding its qualitative focus, TA is also given credit for providing a conceptual framework for contemporary methodologies of quantification: the necessity that TA proposes for assessment of intangible costs and benefits has given substance to attempts for fully quantifying intangible components of new technologies (Primrose, 1991; Polakoff, 1990). This tendency was much in evidence in early attempts to evaluate AMT, CAD-CAM, CIM and other automation technologies (Mensah and Miranti, 1989; Wilkes and Samuels, 1991; Meredith and Suresh, 1986).

The nature of the current problem of IT evaluation in some ways mirrors that of TA. TA uses holistic approaches to cover impacts of technology on different facets of social life; similarly, technological investment valuation seeks to assess the costs and benefits of IT as accurately as possible, by addressing different facets of organisational activity. However, a significant number of problems exist in employing TA approaches – or even its techniques – for the valuation of corporate technology.

To begin with, TA addresses technology as a necessity that needs to be managed in beneficial and egalitarian ways. As such, it strongly addresses issues such as partisan assessment and the role of objectivity of expert groups. Such viewpoints are quite distanced from traditional approaches to economic appraisal of technologies. Secondly, TA, as it originally developed through government collaboration, is a time-consuming, resource demanding activity that is tightly linked to national Technology Policy (TP) and which addresses technology in a complex socio-political landscape. This complexity can seldom be
accommodated by private company practices, not only because firms have different goals than government but also because resources for assessment exercises are limited in the private sector: TA resources are state-based and thus obey different economics. Third, the TA/TP stance towards technology is that of external assessment, whereas private firms seek to assess technologies in the context of their economics, production, strategic goals and performance. Government agencies seek to monitor and control uses of technology with reference to the public well-being (Chang and Cheema, 2002). As such, the TA function does not involve implementation or other involvement in contextual usage of technology, often reinforcing a technological determinism view (Winner, 1986, p. 10). As a result, TA approaches address technologies in generic terms that are often irrelevant to the perceived interests of firms. Finally, because TA broadly serves the purpose of formulating (and reinforcing) Technology Policy, its approach strongly embraces the culture of justification for policy-making: governments often assess technologies according to their interest in maintaining consistent TP, rather than purely on handbook benchmarks. While interesting parallels may be drawn between this practice and the culture of economic justification for in-firm political purposes, such practice departs from the benchmark-driven valuation of technological investments.

Compared with the Finance & Accounting or IS/IT approaches, TA/TP focuses more on the wider social and political facets of technology usage rather than its economic and strategic costs and benefits to organisations. For this reason, the contribution of TA methods to the problem of private firm TIDM is indirect. Apart from techniques such as CBA, CEA and Risk Assessment that may, under certain conditions, address aspects of organisational performance, most TA methodologies have a different focus. For that reason, TA/TP approaches are not discussed in the section on Investment Appraisal Techniques that follows. Nevertheless, the TA approach can prove very useful as an aid to understanding the practice of TIDM as to how processes are implemented to justify technological decisions.

The discussion on TA/TP completes the account on the alternative approaches to TIDM. The three categories examined here – Finance & Accounting, IS/IT and TA/TP – are, most emphatically, not the only ones available\(^\text{20}\). They were selected on the basis of the different rationales they offer over the concept of valuation and the question of technological value. These are broadly of historical and disciplinary descent rather than of practical nature: On the one hand, Finance and Accounting propose the 'improvable measurement' approach, where quantification and numeric representation drive the applied methodologies. On the other hand, IS/IT advocates improvement, not merely through quantitative measurement but also through qualitative assessment and choice that is grounded in a context-specific view of

\(^{20}\) Research literatures, such as Decision Support, Expert Systems and Operations Research are largely preoccupied with mathematical modelling and optimisation of problems of decision-making. These approaches were not explicitly discussed in this chapter because they do not deal with technological investment per se, but rather address it as one of the problems that can possibly be subject to optimisation.
technological value. The strand of TA/TP, finally, also adopts 'improvable measurement' approaches, by seeking best-practice for assessing the value of technology, as perceived within the discipline. However, it deals superficially with the issue of monetary valuation by simply delegating it to Finance and Accounting expertise, while it addresses technological value in its social and political sense rather than its economic and strategic significance to the firm. The ways by which two of the three research strands are formalised into corporate technological investment appraisal techniques are the subject of the section that follows. As noted before, TA/TP techniques are not discussed as such, as their scope falls outside the core interest of this work.

Investment Appraisal techniques for IT

The appraisal of Information Technology investments has traditionally employed a large variety of methodologies, depending on the aims of the appraisal and the research agenda within which it is being addressed. These techniques are discussed in the following section, which will emphasise the fact that there is no direct correspondence between techniques and the disciplines that inform them. Techniques are not developed in isolation but rather through the contribution and mutual influence of disciplines. They are often the result of cross-fertilisation between disparate views.

For the purpose of the present research, three broad classes of techniques are identified: financial, strategic and hybrid. Financial techniques focus on the measurable characteristics of IT or the attributes that can be assessed in monetary terms. The key concern of these techniques is to translate into pecuniary terms as many of the elements of IT as possible and, in doing so, provide a basis for numeric comparison, benchmarking and screening. Through this process, candidate technologies are ranked by order of different performance attributes and decision-making is facilitated by selecting those alternatives that offer the highest value of the chosen metrics (Renkema, 2000).

The strategic techniques for TIDM rely on the strategic facets of IT, as the IS/IT research strand proposes, and treat the economic costs or benefits of technology as a mere component of valuation. According to this class of techniques, TIDM is facilitated by accounting for the potentials offered by IT for improving the firm's capacity, strategic position, knowledge base, reputation and more. This is often attempted by establishing quantitative measures to compare alternative technologies.

The third class comprises hybrid techniques. They often stem from Finance and Accounting or IS/IT but were developed through attempts to address criticisms of their 'parent' disciplines. For instance, techniques developed from Finance practitioners that try to
cover the strategic value of investment belong to this category. So do IS/IT-based techniques that try to address intangibles in terms of economic quantities.

Because the problem of investment valuation of IT has lately been the subject of many research efforts, a large number of categorisations of IT valuation techniques are available in the literature. The one described above is based on the perception of the problem of experts who develop them and, in turn, on the academic and practitioner approaches behind that expertise. The distinction between financial and other categories of techniques is present in most such taxonomies, as it is illustrated in Table 6.3.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Categories</th>
<th>Financial</th>
<th>Strategic</th>
<th>Multi-criteria</th>
<th>Ratio</th>
<th>Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renkema (2000)</td>
<td></td>
<td>Financial</td>
<td>Strategic</td>
<td>Multi-criteria</td>
<td>Ratio</td>
<td>Portfolio</td>
</tr>
<tr>
<td>Nissen (1994)²¹</td>
<td></td>
<td>Financial</td>
<td>Strategic</td>
<td>Multi-criteria</td>
<td>Functional</td>
<td>Subjective</td>
</tr>
<tr>
<td>Irani et al. (1997)²²</td>
<td></td>
<td>Economic</td>
<td>Strategic</td>
<td></td>
<td>Analytical</td>
<td>Integrated</td>
</tr>
<tr>
<td>Land, 1976</td>
<td></td>
<td>Financial</td>
<td>MOMC</td>
<td>(Multi-objective / Multi-criteria)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Farbey et al. (1992)</td>
<td></td>
<td>Financial</td>
<td>MOMC</td>
<td></td>
<td>Experimental</td>
<td>Composite</td>
</tr>
</tbody>
</table>

Table 6.2: Some available categorisations of IT valuation methods.

In the context of the ongoing debate on IT investment appraisal, this section provides an overview of some of the most commonly used and accepted techniques. An extended list of such techniques reported in both the academic and trade literature is presented in Table B.6.4 in Appendix B, featuring more than 75 available techniques and variants. This vividly illustrates both the complexity and importance of the TIDM problem as well as the existence of different perceptions on the value of technology. Rather than exhausting the subject, the aim is to underline the factors that each of these techniques consider, and subsequently examine the descriptive and explanatory power of these factors over IS/IT investments. Ultimately, this examination aims to address the assumptions and beliefs underlying the different categories. Financial methods are presented first, followed by strategic and hybrid types of techniques. The reason for adopting this sequence is that, first, many complex IS/IT techniques use financial methods as components in the appraisal process and, second, historically financial appraisal has typically been used first and then later complemented by the other two approaches.

²¹ Nissen uses the term Functional to denote measures established to estimate the system complexity at early stages of design. Similarly, he uses the term Subjective for methods that try to capture what other categories don’t, and that come mainly from the trade literature (Nissen, 1994, pp. 3-4)
²² Irani et al. propose Economic methods as the structured approaches used traditionally in accounting, Strategic as the less structured ones, that take account of tangibles and intangibles, Analytical as these methods that are highly structured but subjective in nature and integrated as these methods that try to combine financial and non-financial measures and use weighing techniques to address intangible dimensions of an IT project (Irani et al., 1997, p. 698).
Financial Methods

Financial methods are discussed in relation only to aspects that have been shown to have significance for IS/IT investments. Therefore, a detailed examination of the overall efficiency of such techniques falls beyond the scope of this study.

A large number of financial methods for project appraisal have been proposed in the literature. However, most of these are variants of a small number of traditional approaches: The Net Present Value (NPV) rule; the Payback Rule (PB); the Profitability Index (PI); Accounting Rates of Return (ARR or ROI\textsuperscript{23}); and Decision Tree Methods\textsuperscript{24}. The key characteristics of these methods are provided in Table 6.4, where techniques are examined in terms of:

1. The way by which they treat the concept of time.
2. The decision / evaluation criteria they propose.
3. The treatment of risk and uncertainty.
4. The prioritisation of projects.
5. The breadth of application.

Table 6.4 is not a complete list. The popularity of financial methods in conjunction with the belief that accurate measurement of economic benefits is the right solution to the problem of TIDM means that there are many purely financial techniques in the field of IT. Accounting methods such as Economic Value Added (EVA) and Value-at-Risk (VaR) have been employed, while variations on traditional capital budgeting techniques have also been used. The examples of ENPV (Expanded NPV) (Kasanen & Trigeorgis, 1993) and NPV-q (Luehrman, 1998) illustrate such attempts. This persistence in enhancing existing approaches within the remit of Finance and Accounting underlines the point that each class of experts maintains its perception of the problem of TIDM and, from there, attempts to improve its techniques to better describe it.

While the techniques discussed here are well illustrated in finance textbooks as established methods of capital budgeting, their application in IT investments appears to carry significant drawbacks (Lefley, 1993; Wilkes & Samuels, 1991): Table 6.4 shows that nearly all methods treat investment on the basis of accumulated cash inflows and outflows, underplay the interdependence between projects (which appears especially important in IS/IT investment) and provide little information on the long term costs and benefits.

\textsuperscript{23} Return On Investment.
\textsuperscript{24} For a detailed account of these methods, see Brealey & Mayers, 1996; Brigham & Gapenski, 1997; Weston & Copeland, 1991.
<table>
<thead>
<tr>
<th>Measure</th>
<th>NPV/IRR</th>
<th>Payback (and Discounted PB)</th>
<th>Decision Trees</th>
<th>Profitability Index (PI)</th>
<th>ARR (ROI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute Value of Discounted Cash Flow sums</td>
<td>Time to pay back investment</td>
<td>Probability-weighted NPV</td>
<td>Ratio of Present Value of Benefits over Present Value of Costs (PV of benefits per £ of investment)</td>
<td>Ratio of after-tax operating income to book value of assets.</td>
</tr>
<tr>
<td>Time</td>
<td>Defined by project managers / organisation</td>
<td>Measured as evaluation criterion</td>
<td>As in NPV / IRR methods</td>
<td>As in NPV / IRR methods</td>
<td>--</td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>NPV &gt; 0</td>
<td>t=min</td>
<td>Highest NPV</td>
<td>PI &gt; 1.0</td>
<td>ROI &gt; 1, ROI = max</td>
</tr>
<tr>
<td>Risk</td>
<td>Accounted for by 'r' (discount factor)</td>
<td>Accounted for by adjusting hurdle rate 'r'</td>
<td>As in NPV / IRR methods</td>
<td>As in NPV / IRR methods</td>
<td>--</td>
</tr>
<tr>
<td>Uncertainty</td>
<td>Use time as proxy</td>
<td>Shorter PB time = less uncertainty</td>
<td>Use time as proxy</td>
<td>Use time as proxy</td>
<td>--</td>
</tr>
<tr>
<td>Prioritisation by:</td>
<td>Highest NPV (if NPV_A &gt; NPV_B: promote project A)</td>
<td>Shortest PB for same hurdle rate.</td>
<td>Highest NPV of alternative options</td>
<td>Highest PI project receives / higher ranking</td>
<td>Highest ROI</td>
</tr>
<tr>
<td>Breadth</td>
<td>Project Level</td>
<td>Project Level</td>
<td>Project Level</td>
<td>Project Level</td>
<td>Organisation Level</td>
</tr>
<tr>
<td>Comments</td>
<td>Rule views project in isolation (independent project). IRR ('breakeven' or zero-NPV rule) has further pitfalls (Brealey &amp; Myers, 1996: pp. 94-100)</td>
<td>Rule views project in isolation (independent project). Extensively used by most firms in conjunction with other methods (Brealey, 1996). Tool for easy justification of projects (rule of thumb).</td>
<td>Probabilities assigned to alternative options subject to forecasting techniques used. Binary decisions do not take account of all possible alternatives. 'Success' / 'failure' decisions made on arbitrary grounds.</td>
<td>Takes account of only benefits and costs incurred during the same period of time (life of investment). The same discount rate 'r' is used for costs and benefits.</td>
<td>Method rarely used for project appraisal anymore (Brealey &amp; Myers, 1996; Brigham &amp; Gapenski, 1997). Method biased towards firms with high off-balance sheet items (R&amp;D, intangible investments).</td>
</tr>
</tbody>
</table>

Table 6.3: Main Financial Methods of Investment Appraisal.
While it can be argued that financial methods are dedicated tools for Appropriating investment choices to corporate goals, it is intangible investments (often treated as sunk costs in finance) that have proved to bear the highest significance in IS/IT projects. This observation highlights the necessity for IT appraisal methods that incorporate financial, strategic and technological factors. It is this necessity that the IS/IT discipline attempts to cover, as discussed in the following paragraphs.

**Strategic Methods**

'Strategic methods' refer to techniques where assessment is primarily driven by strategic aspects of investment and where financial measures of returns and expenditures are either implicit (i.e. not used as primary evaluation tools) or unclear. Such methods are also referred to in the literature as *non-financial* methods (Renkema, 2000). Strategic methods mainly stem from the IS/IT tradition, although they are much influenced by Economic sciences as to their quantitative character. On the one hand, they do not use IT investment valuation in the asset sense that Finance and Accounting does, while on the other, they introduce ratios or other comparative devices to facilitate ranking or other screening processes for projects. These techniques are discussed in the following few paragraphs.

A useful account of non-financial methods is provided by Renkema (2000), where seven such representative techniques are selected from a body of 65 discrete methods (both financial and non-financial) and compared on the following grounds:

1. The breadth of the method (i.e. whether assessment is done on the level of a specific project, or the entire firm).
2. The type of application area; that is the applicability of methods to IT only or general business investments.
3. The evaluation criteria, where distinction is made among financial and non-financial criteria and risk.
4. Support of the decision-making process, i.e. the extent to which the evaluation of initial appraisals is made with the participation of different interest groups, in a coherent and knowledgeable manner.
5. The measurement scale, especially in non-financial methods, where quantification of qualitative parameters is liable to severe errors.

Renkema also provides an additional level of classification of techniques by dividing them into:

1. **Multi-Criteria Methods**, which utilise one single measure for the appraisal of all IS/IT investments.
2. **Ratio Methods**, whereby investments are scored by comparing ratios of financial or non-financial measures.
3. Portfolio Methods, where evaluation criteria are defined and decision-making is done with the use of management 'grids' or portfolios.

Multi-criteria methods incorporate qualitative and quantitative parameters, but they suffer from the drawbacks of the difficulty of comparing decisions and their impacts on an equal score benchmark. Two of the most widespread multi-criteria methods are illustrated in Table 6.5, namely the 'Information Economics' method (Parker et al., 1988, Wiseman, 1992) and the SIESTA method (Van Irsel et al., 1992). Both methods treat the business and technology domains as separate but interacting entities.

Ratio-Based methods attempt to overcome the underlying vagueness of multi-criteria methods by using ratios that refer to corporate performance, and incorporate non-financial data such as numbers of employees involved in projects, time schedules and management effectiveness. Two such methods are presented in Table 6.5, namely 'Return on Management' (ROM) (Strassmann, 1990) and the 'IT Assessment' method (Zee and Koot, 1989), both using benchmarking of IT investments, supported by company information databases. Despite the relative consistency on results that such methods promise, building a benchmarking system on performance data of past projects may hardly allow for a reliable appraisal of projects.

Portfolio methods are based on the technique of management grids (Johnson and Scholes, 1993), where entities (i.e. products, projects, companies etc) are placed in a grid according to their properties. Portfolio methods combine the comprehensiveness of the multi-criteria methods and the visual representation directness of managerial grid techniques. However, they cannot incorporate as many parameters as other techniques, which may be a severe drawback. Examples of such methods are the 'Investment Portfolio' method (Bergout and Meertens, 1992) and the 'Investment Mapping' (Peters, 1988). Both methods use generalized 'dimensions' in their grids to place the examined projects by their values across each dimension. In general such dimensions are decided upon through a complex pre-process so as to take account of as many parameters as possible; however, the weighted contribution of each parameter is likely to be lost inside these generalized 'dimensions'.

As with the financial methods discussed earlier, the list provided in Table 6.5 is far from exhaustive. Non-financial techniques are constantly being developed. This is done primarily to achieve better depictions and representations of IT contingencies in particular organisational settings, because it is all the more recognised that the value of IT depends on the implementation setting.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Type of Method</th>
<th>Financial Methods</th>
<th>Multi-criteria Methods</th>
<th>Ratio Methods</th>
<th>Portfolio Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Information Economics</td>
<td>Return on Management</td>
<td>SIESTA</td>
</tr>
<tr>
<td>Objects of the Method</td>
<td>Breadth</td>
<td>Project-level</td>
<td>Project-level</td>
<td>Project-level</td>
<td>Project-level</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Business Investments</td>
<td>IT Investments</td>
<td>IT Investments</td>
<td>IT Investments</td>
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<td>4 Business Criteria</td>
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<td>1 Technological Criteria</td>
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<td>Risks</td>
<td>Deduction from Expectations or Coverage through Adjusted Discount Rate</td>
<td>None</td>
<td>None</td>
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<td>1 Business Risk, 4 Technological Risks</td>
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<td>4 Business Risks, 8 Technological Risks</td>
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<td>Discussed Examples and Mentions Stakeholder Groups</td>
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<td>Maximal Appraisal is Once Every Year, Mentions Top Management and Project Management</td>
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<td>Technology and Measurement</td>
<td>Ratio and Ordinal</td>
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<td>Interval</td>
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Table 6.4: Methods for IT Appraisal (adapted from Renkema, 2000)
Hybrid Methods & their contributions to integrated approaches

This section deals with 'hybrid' methods - a term coined to signify extensions of standard practices, which aim to accommodate financial, strategic and other IT-specific elements under one roof. While based on both types of evaluation, hybrid methods attempt to address issues that originally fall outside their parent disciplines. These were typically developed to overcome the weaknesses of 'strictly financial' methods to explain non-pecuniary impacts of investment decisions and to enrich strategic methods with more complete and concrete representations of IT investment. Yet again, because a large number of such methods exist, this discussion concentrates only on the details of those with the most significant impact, namely Real Options Valuation (ROV), Balanced Scorecards and their variants and methods that address the subject of Knowledge Assets Valuation (KAV).

An initial approach to hybrid methods was proposed by Wilkes and Samuels (1991) with the 'X-Gap' method where the part of the investment proposal that cannot be justified by the strictly financial techniques is left to the management’s judgement. Despite the fact that this approach recognises the importance of non-quantifiable or intangible investment, it does little to provide a conceptual framework for treating it. A more systematic approach to technological investment is provided in the Strategic Cost Analysis method (Shank and Govindarajan, 1992) where an attempt to link financial measures to the strategic advantages of technological innovation is made.

Possibly the most influential hybrid approach offering a holistic perspective of TIDM is Kaplan and Norton’s (1992) Balanced Scorecards model25. A broad depiction of the model can be found in Figure B.6.1 in Appendix B. Despite the fact that one could categorise this method as a 'multi-criteria' approach, Balanced Scorecards originally stem from management accounting practices and form an attempt to translate a company’s strategy into specific measurable objectives. Balanced Scorecards were developed on the basis that financial accounting measures provide misleading indications for technological investment appraisal (and AMT in particular) and therefore a framework is needed to translate the firm’s strategic aspects into measurable entities (Kaplan, 1989). The key features of the method are the grouping of homogeneous metrics into clusters and the linkage between measures to increase clarity and communicate these across the organisation (Papalexandris et al., 2004). The method claims to use a balanced mixture of financial and non-financial metrics (Kaplan and Norton, 2001). Variants of this method have also been proposed by Willcocks and Lester (1994) for IT-specific

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25 The Balanced Scorecard technique distinguishes between performance measures in four areas or perspectives: (1) customer perspective, (2) internal business perspective, (3) innovation and learning perspective and (4) financial perspective (Kaplan & Norton, 1992; Meltz et al., 2003).
investments, as well as by Maltz et al. (2003) and others. Because Balanced Scorecards and its variants propose a comprehensive set of parameters, they enjoy significant popularity, especially among practitioners. However, Balanced Scorecards face criticism of its inadequate coverage of intellectual capital and the contribution of employees and suppliers in creating value, its failure to identify the environment in which the organisation operates and its inability to accommodate the longer term (Smith, 1998; Atkinson et al., 1997). They are also criticised for being subjective in linking strategic parameters, as well as being unable to assess performance on the basis of multiple criteria (Papalexandris et al., 2004).

A more explicitly finance-based technique is that of Real Options Valuation (ROV). It involves the use of financial options pricing theory and the Black-Scholes options pricing model (OPM) (Black & Scholes, 1973; Hull, 1997) to assign values to real strategic investment options faced by corporations (McDonald & Siegel, 1986; Dixit and Pindyck, 1995; Copeland & Antikarov, 2001; Damodaran, 2001). The method is based on parallels drawn in the IS/IT literature between the exercise of American\(^{26}\) call options and the actual options a corporation faces, to promote, postpone or cancel a project (Dos Santos, 1994; Benaroch and Kauffman, 1999). Real Options Valuation has been appealing in IS/IT investment appraisal due to its ability to introduce the characteristic of ‘irreversible investment under uncertainty’ (Dixit and Pindyck, 1995; Kambil et al., 1993). It is also popular because of its claims to discard the arbitrariness of DCF risk-adjusted hurdle rates (De Reyck, 2003; Bose & Ho, 2002) and because it provides a measure for management flexibility (Yeo & Qiu, 2003). However ROV appears to fail to provide usable information on IT investment timing: While the Options Pricing Model allows for assigning values to ‘preliminary investigations’ for IT projects (Dos Santos, 1994) and to postponement options, it does little to indicate the appropriate time for an investment proposal to be implemented (Lint and Pennings, 1999). Recent attempts have been made to propose IT investment timing through ROV relying on financial metrics such as the firm’s ‘free cash flow’ (Campbell, 2002). Overall, issues of complexity prevent option theory from being a precise tool for managerial appraisal, even though its use may constitute a conceptual decision framework. Real Options, as a frame for thinking at large is considered by both practitioners and academics a useful tool for reminding managers of the pitfalls of neglecting the strategic value of IT and over-relying on centrally prescribed hurdle rates (Faulkner, 1996). As a result, a significant number of variants of ROV exist in the literature (Scarso, 1996; Botteron et al., 2003; Yeo & Qiu, 2003 and others).

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\(^{26}\) While American options can be exercised before maturity, European options cannot (Hull, 1997)
The use of IT systems to manage organisational knowledge has been recognised as being of central importance to IT valuation (Shin, 2004; du Plessis, 2005). Learning and customer knowledge are explicitly addressed in the Balanced Scorecards approach where an intangible assets accounting approach is proposed. Ample systematic attempts to address knowledge as an intangible asset exist in the Knowledge Management literature. In these, corporate knowledge is divided into (1) public knowledge, (2) industry knowledge and (3) company knowledge (Huseman & Goodman, 1999: p158). Despite the wide recognition of the significance of knowledge in sustaining competitive advantage, there is little understanding of how knowledge management is put into practice (Nonaka et al., 2000). The need for measuring and evaluating knowledge assets was recognised in the early nineties with the work of Romer (1993) stating that ideas (as opposed to labour and capital) are not subject to laws of diminishing returns. The importance of knowledge in technological innovation enjoyed wide treatment in the STS literature (Faulkner, 1998; Fleck, 1998 & 1999; Freeman, 1997) while the first theoretical attempts to introduce accounting value to the employees of firms (as agents and owners of knowledge) date back to the 1980s with the development of Human Resource Accounting (HRA) (Sackman et al., 1989). Literature in the area of Knowledge Management (KM) identifies a number of proxies used to measure knowledge assets: Human Resource Accounting (HRA); intellectual property; organisational learning; and accounting standards (Wilkins et al., 1997) are examples. Efforts have been made to incorporate Knowledge Assets Valuation (KAV) in financial reporting by accounting practitioners (Rennie, 1999; Lynn, 1998). However, established methods for investment appraisal reportedly failed to introduce KAV into the evaluation process. Intellectual Capital was largely seen in the Knowledge Management literature as a suitable representation of knowledge and a basis for achieving its measurement. Intellectual Capital theorists identify three stores of value in the organisation: customer capital; structural capital; and human capital (Huseman & Goodman, 1999). The most popular application of Intellectual Capital accounting practice is the so-called Scandia IC Navigator (Edvinsson & Malone, 1997), named after the Swedish financial services firm Scandia, which implemented it for the first time in 1994. By using the above categorisation of Intellectual Capital, the Scandia Navigator sought to identify and measure the intangible assets that create value to the firm. With specific reference to IT, it is recognised that although the knowledge revolution is inspired by new information systems, IT cannot deliver Knowledge Management in its own right, as knowledge involves a multitude of interacting components (McDermott, 1999). The above considerations underline the necessity for future IS/IT investment appraisal methods to provide sufficient scope for valuing knowledge assets in project proposals.

Notably, hybrid methods develop out of the need to address new, value-creating aspects, the contribution of which is ignored or underplayed by traditional techniques. To come
to terms with that need, academics and practitioners attempt to combine existing techniques by enriching them with new notions, without departing from the original assumptions the technique relies on. The example of Real Options Valuation and Human Resource Accounting illustrate that point: ROV proposes accounting for strategic value by assigning financial values to available opportunities; similarly, Human Resource Accounting proposes the embodiment of human capital into the traditional structures of accounting reports. Yet such attempts appear to do little to cross their disciplinary boundaries. Instead, they propose ways for including concepts that their disciplines ignored previously and, in so doing, persuade the scientific community that their techniques are rigorous and flexible because they can address the new value-creating concepts. Certainly, this attitude is primarily driven both by academic research agendas as well as publication strategies.

The discussion on hybrid techniques serves as background to the wider contention of this thesis, that the paradigm of improvable measurement introduced in this chapter is bound with the risk of seeking improvement through merely aggregating existing techniques instead of radically addressing the TIDM problem by integrating them. Hybrid techniques have been devised to mitigate the disadvantages of financial and strategic ones by offering a more holistic perspective; however they are also results of technique aggregation, because they largely use existing methodologies and approaches by migrating them across different fields. Improvement in appraisal techniques is typically pursued as a negotiation between established regimes of academic knowledge. Conversely, the integration approach does not only take account of the theoretical context and the research perceptions that accompany methodologies, but also assigns a natural political role to the Actors who participate in the underlying research agendas.

Conclusions: aggregated vs. integrated approaches

This chapter dealt with how the value of Information Technology is traditionally assessed in academic fields. It began by presenting the dichotomy between processes developed for TIDM in both Observer and Practitioner spaces, and practice, established as the result of Practitioners’ perceptions. It then presented a categorisation of academic research approaches according to their perceptions on measuring technological value. The discussion continued with a wider debate on whether the value of technology is fully measurable, formalised as the ambiguity of normative quantitative assessment. It was suggested that, according to the Actor-based IGT approach, each research strand can only optimise its measures of technology within its own frame of understanding. A detailed account of three such wide research strands was used to demonstrate that point, followed by a discussion of methodologies that largely come from these.
All the techniques discussed in this chapter are the output of the professional activity of academics, namely published academic work. This activity obeys the rules of professional reward by written communication of ideas to peers for reviewing, rather than the practical implementation of techniques on organisations. In that respect, the objective of TIDM techniques development is often very different from that of TIDM practice. This thesis is addressed in more detail in the next chapter.

Ultimately, it is observed that the efforts within research strands are aimed at improving their measures of technological value, typically by aggregating existing methods. Conversely, the Actor-based IG T suggests that the issue of TIDM should be approached through integrating methods and thus recognising that they are informed by research agendas of the underlying disciplines.

The fact that, to date, no universal technique for TIDM has been agreed upon implies that there is scope for new developments in the field. However, agreement can only be reached when all alternative approaches to TIDM are adequately accommodated, or when one of these approaches dominates over others. This is because each research strand perceives the problem of technological value in distinctively different ways. Two observations are made with respect to that statement: First, it is inevitable that the quest for such a conclusive assessment of technology is made within the frame of understanding that each research approach (in this thesis, Finance & Accounting, IS/IT and TA/TP) has on the problem of TIDM. It therefore relies each time on how one strand views the others. Second, that each of the three strands discussed before, functions on the grounds of improvable measurement and therefore seeks to provide a better account of technological investment by improving its techniques. Consequently, improvement is, most often, only sought within each frame of understanding, even when it appears that disciplinary borders are crossed\textsuperscript{27}. Therefore, the search for the 'ultimate technique' that will facilitate TIDM in the best possible way is becoming a question of dominance of one approach - or paradigm - over others.

This traditional stance to progress in technique development can be termed aggregation of techniques. This stance proposes that we arrive at improved methodologies by either bundling

\textsuperscript{27} One example of this tendency is given by the developments in Critical Accounting (Cooper, 2002; Galhoffer ans Haslam, 1997; O'Regan, 2000). Laughlin (1997) provides a definition of critical accounting as 'a critical understanding of the role of accounting processes and practices and the accounting profession in the functioning of society and organisations with an intention to use that understanding to engage (where appropriate) in changing these processes, practices and the profession'. Critical Accounting results from the conscious recognition from Accounting scholars that, in order to be realistic, Accounting should consider parameters of corporate practice and market conduct that it traditionally did not. However, a closer investigation of the relevant literature (Laughlin, 1997; Sikka and Willmot, 1997) suggests: (1) that development of Critical Accounting merely serves as a statement of completeness to defend against criticism and (2) that even where Critical Accounting offers productive contributions, these are improvements that rely on the perceptions of Accounting for other disciplines.
multiple techniques under a common framework, or by migrating parameters from one class of techniques to another and adapting their metrics to suit the adopted model. This incremental stance is typically adopted in the context of improvable measurement: any research strand will seek to develop improved methods by either enhancing its measurement or by establishing metrics to account for aspects that it did not previously deal with.

Instead of that stance, the problem of TIDM calls for the development of integrated techniques. Unlike the aggregation attitude, developing integrated techniques is based on addressing the problem of technological value through perception-contingent measurement, where the role of Actors is recognised and the appraisal of technological investments is pursued by identifying interested parties, their knowledge base, their political positions, and the existence of conflicting perceptions of reality that shape the problem. That approach would explicitly recognise conflict across disciplines and practitioner expert groups and would also underline the importance of political negotiation that comes with decision-making practice. The development of such integrated approaches lies at the centre of the problematic of TIDM and is a goal set by researchers and practitioners alike. This discussion will be provided in more detail in chapters 8 and 9.
Chapter 7: The Case Studies: Handbook Approaches and Established Practice in TIDM for Internet Banking

Introduction

The previous chapter dealt with IT investment valuation methods developed in the world of Observers. These were termed the research approaches to TIDM, and reflect the methodologies of technological investment valuation proposed in the literature. Research approaches were reviewed through three broad frames of understanding, represented by the research strands of Finance and Accounting, IS/IT and TA/TP. The rationales of each were addressed and the methodologies that stem from them presented. In that discussion, it was underlined that techniques for IT valuation do not arise from single research strands but often develop through contributions from multiple disciplines. The chapter discussed the relative merits of each class, and concluded that there exists scope for readdressing the issue of TIDM, by departing from the traditional tendency to aggregate techniques or add parameters to existing models. Instead, it suggested that the contribution of Actors should be taken explicitly into account, and, as a result, new integrated techniques should be developed to identify how these Actors formulate the problem of TIDM.

The present chapter addresses approaches to TIDM which derive from the Practitioners' space. These are discussed in light of the process-practice dichotomy, namely the disparity between the normative viewpoint on how TIDM should be made, and the pragmatic one on how TIDM really happens. The chapter draws on empirical work that includes 30 interviews with banking executives and secondary documentary evidence. The
methodological approach was discussed in Chapter 3, while many of the practical considerations on conducting interviews and their particularities are addressed in Appendix A.1.

The chapter begins with an analysis of the interview data which explored six themes which developed from the initial research questions\(^1\). As more information became available and greater focus on the pertinent issues was achieved, three of these themes emerged as most pertinent. Observations and conclusions derived from this analysis are then framed into an empirical descriptive model to illustrate the interconnections between handbook-prescribed processes, the installed decision structure in the firm and the expert groups' perceptions. Ultimately, it is proposed that TIDM reality is constructed through that interconnection. The chapter concludes with some observations about the sources, reasoning and impacts of the process-practice dichotomy which emerged from the empirical work.

**Thematic Analysis of Findings, Rationale and Approaches**

This analysis takes place within a framework of themes which have been derived by observing responses to initial research questions and drawing on what interviewees see the most pertinent issues to be. Although the process through which the final thematic entities are derived is largely judgemental, its broad mechanism is represented in Figure 7.1. This is an extension of Figure 3.1 where the iteration steps for designing and optimising interviews were explained. In Fig. 7.1 a second loop is used to aggregate interviewees' opinions about what are the pertinent issues in TIDM. That loop demonstrates how respondents' perceptions of the problem are ascertained and how the focus of interview questions on these issues was adjusted. Given that the whole empirical research aims to disclose and address experts' viewpoints and the ways they influence TIDM, that iterative process plays a crucial role.

It is important to underline that while the initial research questions were developed to identify the most important TIDM issues to be addressed early on, the final themes discussed in this chapter are driven by the disclosed understandings of experts, rather than by what is available in the academic and trade literature. That explains their significant divergence from the initial research questions. A detailed account of how the empirical research evolved is provided in Appendix A.1.

\(^1\) A discussion of the initial research questions and how they were used is provided in chapter 3.
The process described above was used to transform the initial research questions into the final thematic entities by informing them with interview data. Because the aim of the research was to underline the importance of the viewpoints of the different expert groups disclosed in interviews, the focus gradually shifted from the wider problematic areas that were recognised initially, to the primary points of disparity between experts' views. The six areas of interest that were derived through the process described in Figure 7.1 were:

1. **The establishment of processes for TIDM and their practical applicability**: this is a core issue in discussing the extent to which technological investment decisions are facilitated by resident decision processes, and, in turn, to what extent such processes stem from the research approaches discussed in chapter 6.

2. **The perceived importance of technological implementation** as a process as well as the practitioners' understanding of technological value: that was recognised as a key issue to resolve when addressing the practical attitude of banking professionals and wider organisations (i.e. the formal stances of financial institutions) to appraising IT projects.
3. **The development and dynamics of expert groups** within the organisation and the broader industry. This issue was repeatedly identified as a critical factor in determining the dominant positions of experts in firms, and is an area which forms one of the key building blocks in the proposed Actor-based theoretical framework. Its discussion additionally draws on historical evidence regarding past patterns of expertise evolution and looks to identify present and future developments.

4. **The organisational structure and built-in hierarchies for decision making.** This was seen as an important area for examining how resident decision structures (and experts in them) influence the perceived importance of valuation methodologies and handbook processes in the overall decision outcome. This theme also refers to an important component used to address the social construction of TIDM in the Practitioners’ space.

5. **The influence of wider economic cycles** and how these are perceived by financial institutions on TIDM and on the levels of rigour in IA processes. This is particularly relevant to managerial behaviour that is influenced by external valuations (such as the stock market, financial analysts and other external expert centres). It is furthermore very relevant to investigating the change of perceptions of managers on TIDM before and after the dot-com boom period.

6. **The role of knowledge and learning in TIDM.** This is largely based on the lately identified need for valuation of knowledge and the role of Knowledge Management (KM) in the measurement of performance of technologies. This theme also addresses the debate as to whether Knowledge Assets Valuation (KAV) and the assessment of other intangible assets would provide a more complete reflection of the value of technology. It is also very relevant to discussing the role of uncertainty in making post-implementation knowledge usable for improving handbook processes.

These six areas encapsulate the major issues arising from the 30 interviews that compose the empirical basis of the research. A brief account of the findings categorised by the six themes is provided in Table B.7.5 in Appendix B, also providing reference to interview materials.

Upon further analysis it became clear that the key areas this research would focus on were represented by the first three of these themes: the usage of formal processes for TIDM; the perceptions of investigated firms about the role and value of technology; and the role of expertise in determining how TIDM is viewed in firms and the industry. Findings relating to the remaining three themes were found to be peripheral significance and while they inform our knowledge of TIDM process and practice, they are not discussed separately in the following paragraphs.
The Practical Landscape of TIDM: Empirical Findings

The establishment of processes for TIDM and their practical applicability

The first and most important finding concerns the use of installed processes. Although formal, detailed processes for facilitating TIDM are in place at all firms, technological investment decisions are largely made on a strategic basis. In that process, the role of the Finance function most often assumes the supporting role of justifying decisions that have already been made at the executive level on strategic and political grounds. That is despite Finance’s seemingly leading role in evaluation and economic ‘health checks’. That conclusion is repeated throughout the interviews (see also quotes 1, 2, Appendix B):

"...but the ultimate decision in large organisations comes down to the power and the background and the desires of maybe one or two individuals right at the top of the organisation, quite independently of, maybe, the financing..." (1.7, §13)

"...what I also would maintain is that, by and large, financial departments analysing projects have very little, shall I say, clout in the decision-making process. What they’re actually doing is providing an independent take on the assumptions and the sorts of understanding that the business has around this project..." (1.7, §15).

Interviewees provided explanations as to why, despite the prevalence of strategic-only decisions, the Finance function still appears to maintain the pertinent role, as well as what mechanisms lie behind the actual, supporting (as opposed to the prescribed leading) role of Finance. With regard to the first point, interview data suggested that Finance appears to have the strongest say in TIDM because it has to do so, to defend its established image and natural role in the firm: that of the official gatekeeper of the firm’s economic resources (see also quote 3, Appendix B):

"...It is the expertise to bringing together the whole picture, and then understanding for each project what the key dynamics are. That’s where I think Finance are invaluable. Because in different projects, different lines of the financial model will be critical; and for some of them it will be units we sell, but for others it will be balance levels or what the funding rate is. So, they’re a key member of this core team..." (1.8, §31)

"...each business unit ... has a finance manager, an accountant if you like. Whilst his primary reporting line is to the unit boss, he does have a secondary reporting line into the Finance function. Now, in this organisation, and I think it’s fairly usual, Finance has a dual role: First of all, it does have a role to protect the numbers. But it also has a role about risk management. In consequence of that, the Finance organisation tends to be a part of all the relevant decision making bodies ..." (1.3, §21)

This role is in line with the common market perception and wider popular belief that the Finance function should provide economic appraisal input through the use of dedicated techniques and thus facilitate decisions. In so doing, the market rationale goes, it fulfils its
instrumental role in maximising shareholder wealth. It is therefore crucial that Finance appears to shareholders as a function that provides a ‘health check’ by filtering out inefficient or untimely projects (see also quote 4, Appendix B):

“...that group decides what it does need to go forward; ‘yes, this is a solid business case’ and when it should be done. What we did was we had a load of ideas; so a lot of load hanging through as you can imagine from an efficiency point of view after startup operation. So to slow things down, we’ve put a 2 to 1 ROI minimum as a selection criterion...”  (2.4, §13)

“because we said ‘we set a hurdle rate. There is no point in bringing a case to the table unless the return exceeds this threshold’ to ensure that the case... we’ll kick it around and make sure that it is robust...”  (2.5, §18)

Furthermore, because Finance is traditionally one of the key functional units of any organisation, its work – as a matter of corporate image - has to be visible in the outcomes of any decision-making instance.  

As regards the mechanism behind the transformation of Finance’s leading role into a supporting one, empirical data from the examined banks provided relevant evidence:

“...I think we engage the Finance team, the Finance Departments, from the start to help us develop the business cases. So they are a support tool in that regard. They’re also the control and the check on everything, which is the point you were largely making – if they say ‘no’ to things, then they don’t happen – I think it almost has to be that the Finance case is just one of the aspects, rather than just the overriding one...”  (3.1, §33)

“...in order to justify expenditure with view to shareholders, obviously we have to quantify as much as we possibly can; so, in truth, I suppose, there is some element of post-rationalisation here...”  (6.1, §52)

An apparent role in the process is given to the assessment of intangible benefits:

“We do try and build in intangibles but, of course, we are driven by a range of short and long-term financial measures; and the challenge is always to keep your eye on the longer term and making sure that you don’t forget the longer-term investment projects. But that is quite difficult at this moment. The City is very focused nowadays, increasingly so in terms of what are specific pieces of work doing to produce value for shareholders; and I think the City’s view on the long-term could probably stretch to three years, but that’s about it.”  (2.1, §57)

“...I think in terms of the IT aspect of it, the biggest challenge there is understanding the cost dynamics and the delivery aspects of it, and I think that is quite a lot of the work that we’ve done in the early phases really: to get really clear on those costs, especially when that part that we were doing was trying to build part of our differentiation...”  (3.3, §8)

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2 That is, should a decision result in a successful outcome, for reasons of market image that positive outcome will have to be presented as the result of efficient coordination between departments and, most important, as the result of rational economic assessment. By the same token, presenting the market with a successful venture or project that was made despite negative valuations does not send a positive signal as to Finance function. Results and financial valuation have to be presented coherently to the outer world.
That is not only because technology investments are often made as a necessity, but also because, more often than not, accurate economic appraisal of IT projects implies the need for complex decision models, for which the firm would not be prepared to allocate resources (1.2, §46). Such intuitive practice creates a conflict between the prescribed function and the actual role of Finance: Finance, on the one hand, has to defend its assumed position as the cornerstone of economically robust decision-making, whilst, on the other, it needs to play its operational role constructively in facilitating efficient TIDM.

As the interviews indicate, there is no unanimous perception of what the precise role of Finance in decision-making is, although viewpoints tended to reflect educational background and training, on the one hand, and professional position, on the other. That disparity notwithstanding, it is evident that, in actual practice, Finance often assumed a role in TIDM that was as powerful as (but totally different from) its traditional role of evaluation-based decision making: that of advocacy for technological propositions (see also quote 5, Appendix B).

"...And as the business develops, you're going to have a changing role of the Finance team from being more about evaluation and support and investment appraisal approach, to more support for the business and making sure that the project is implemented on time, on cost budget etc..." (9.2, §25)

"...certain aspects of Finance that are coming into the support function and there to provide information for the people who want to make decisions and the people who have come up with innovations - they might not have the tools to gather all the information that they require, that's our job as well I would say..." (1.6, §26)

This role is significantly different from the function of Investment Valuation, in that valuation outcomes are only used in the political sense, whereas assumptions and inputs to valuation techniques are manipulated to deliver a desired result (see also quote 6, Appendix B):

".....it is just a game actually. ...I know very well that it is actually strategic rationale. I know the tools, if anything at all, would be secondary to justifying an investment or investment project. They are secondary. A lot of these are still strategic in nature. Having said that, I am not sure whether this is actually because we're doing something fairly new anyway. We're sort of close to pioneering the industry..." (10.1, §85)

"...So, what you'll find is that within organisations there will be the internal politics that prevail between those who are promoting the new technology and that technologies are the cheap way of doing business and facilitating payments versus a cash cow, an existing product line for which people are on bonus targets. So, that's clearly an aspect that has to be recognised..." (1.7, §21)

This advocacy role sits comfortably with two of Finance's key characteristics: an inherent reliance on numerical representation and quantitative comparison; and its natural ownership of the pecuniary aspects of the organisation which means it is seen as key to the firm's existence (2.4, 72).
These characteristics underline the argument that Finance is, by definition and position, inherently political: The first characteristic suits the role of financial advocacy by using the persuasive power of numbers, based on scientific legitimacy and practical simplicity. It thus often serves the 'satisficing' tendency of decision-makers by offering simplified decision proxies (Simon, 1957), without doing violence to the requirement for using financial methods for investment justification.

"...I think the numbers can tell a lot of different stories; quite often there can be more subjectivity brought into the process, and I think, in my experience, you can find that if people's opinion is something that is not very strategic, then they can focus on the negative aspects of some of the scenarios. And vice versa;..." (3.3, §28)

"...You know yourself that you can always produce a set of NPV numbers which work. You can! You just play with it. The real argument – there are 3 hurdles you have to get over – (1) can I convince people that this is something we need to do? That it fits with our vision; that it fits with our strategy. (2) Can I actually persuade them that the numbers make sense? Can I fudge the NPV? And thirdly, can I actually get hold of whatever is the scarce constraint; the scarce resource? In the case of many banks, certainly running up to the Millennium, it was IT. And that was it..." (1.2, §48)

The second characteristic does the same through the power of recognised expertise on a subject that is central to the firm's survival (i.e. economic profit). On that account, Finance's justification function is a natural fit between its intended purpose (evaluation-based technological decision) and the reality of strategy-based TIDM that seeks supportive argument. Looked at from another viewpoint, this is a negotiated position between ensuring power and surviving the challenge posed to traditional valuation during the dot com bust.

(1.5, §14; 1.8, §47)

"...[the project] probably did cost quite a bit and it had Executive approval; that's why when it was delayed, it was quite political. But on related projects, on which I spent quite a bit of money without actually going through an investment appraisal process, it was seen as 'we must do it' and it was this kind of quick and dirty things and there will be benefits..." (7.2, §31)

The empirical data reveals two other essential features of the Finance practice. Firstly, finance had, almost unanimously among sample firms, the determining role in prioritising IT projects, regardless of what final TIDM method was used (see also quote 7, Appendix B):

"...we would do a very high level CBA on them, or see which ones are of strategic benefit and so on. So we take a number of projects, do a cost-benefit on them – mostly focusing on the costs – and at that stage, each of these areas will probably make a presentation to our Executive at a very high level, where they say "this is our problem of work; this is what we think it's going to cost, and this is what we think the benefits are going to be". And invariably they come back with "we don't have that amount of money. Drop some projects. We're not going to get enough benefit, so we need more benefit from that". So it goes in a bit of a cycle here..." (1.9, §28)
"...and the model simply requires you to put in your estimates of cost. If they're right then, it doesn't mean that you certainly got priority but it does really say that it can be prioritised. Typically, what happens of course is that, if you don't think you're going to make that hurdle rate, then you find some other means of improving the profits or reducing the costs until you do. But it's a valid point; I'm sure that in reality, the people who are doing the capital appraisal will be modelling risk..." (1.3, §33)

This demonstrates how 'financial thinking' is used as an instrument for rationalisation of technological propositions at early stages where details are unknown and where broad assumptions can be made about each competing project. Secondly, because company-wide requirements are often expressed in financial terms (such as company-wide hurdle rates), the Finance function is most often used to simply ensure that these are being followed. It thus serves its executive role in 'tracking' the firm's accounting ratios (see quotes 8.9. Appendix B):

"...Quite clearly, there will be a centrally prescribed discount rate. The group finance function will say 'the discount rate to be applied to projects is X'. And people, if they wish to demonstrate that this is a rock-solid project, they will actually say 'well, I've increased this by 3% to allow for the additional risk or whatever'; and occasionally you see it the other way where people arbitrary tell you 'it shouldn't actually be 15%; it should be 12% because...'." (1.2, §44)

"...the criteria by which we are judging projects is very very high at this point. For a project to be considered for delivery this year, it must deliver a ROI of 2/1; so the benefits must exceed the cost of investment by 2 to 1 within this financial year. ....." (2.2, §12)

Yet again, that practice demonstrates that, at least in the early stages, little attention is paid to the effective financial evaluation of IT projects themselves; instead, the 'financial health check' task of Finance consists of applying homogeneous rules across the board and, most often, at the higher level.

"...because we certainly set ourselves very tight P&L targets, certainly in our bonus structures and things, actually we agonised much more over a decision, which actually, if you were taking a step back and look into it strategically—which is what I said we try to do — you may have actually opted for that investment for priority over the other one..." (3.3, §37)

"...unless it delivered X amount of profit and it wasn't a five year plan to achieve a particular profit, we wouldn't even consider it;" (7.1, §47)

This encourages viewing all investments (capital, infrastructure, property, IT, acquisitions etc.) in identical ways. While such a stance apparently simplifies financial strategy, it promotes the implicit assumption that all investments, technological ones included, have a qualitatively similar value for the organisation (with regard to strategy, operations, market share etc.). Similarly, that stance assumes that the release of benefits from investments is performed in an identical manner and under similar timelines for all investment types. Both these observations arise directly from the justificatory role of Finance, as they indicate that,
far from playing the scientific-evaluative role of assessing investments, the function of Finance is one of protecting the numbers at the higher level and making a case for using measurable financial value as the core means for project appraisal. At the same level, however, investment decision strategies at large were reportedly influenced by deeply established perceptions about value and valuation.

"...we had a very different internal reaction to the choice of two projects: one was a case where we were taking a stake in another company versus another one where we were investing into developing a new product; and they were ironically for the same amount of money. Because one was a capital investment, - obviously the same shareholding funds were being used but the one was a capital investment- it was approved very very quickly and [the bank] being the largest shareholder, their reaction was “oh, 10m pounds is nothing! Why worrying? It's a great idea; go ahead and do it!” So, that involved quite a simple assessment and then a Board meeting, which approved it. Whereas the 10m-product development investment would hit [the bank’s] P&L and actually stimulated a much longer and more lengthy and more in-depth process around investigating the implications: “Do we really believe it? Do we want to spend that here or do we want to spend it on something else?” But then net result of both that spending would be the same into the shareholder outflow. So, that was quite interesting...."

That pattern may well be the result of the influence of a prevailing culture: capital investments are considered a stable type of asset allocation that is predictable, characterised by low uncertainty and obeying familiar rules of valuation. Furthermore, because of that, a capital investment decision would be naturally more confined to the specialist area of Finance and Accounting, which greatly simplifies the process. Conversely, product development or any type of infrastructure investment is perceived as a complex multi-stage process demanding input from a multitude of functions (IT, Operations, Strategy, Compliance, Marketing and so on); such decisions cannot therefore be subject to simple economic assessment rules, and are furthermore influenced by all the aforementioned expert groups, often becoming fields of political in-firm negotiation (5.1, §35-38 and quote 10, Appendix B).

"...And the reality is that when push comes to shove, it becomes political; which is what it shouldn’t be; the decision should be based on fact; we’re doing this because we have this information on the financial aspect, as well as strategic impact..." (5.1, §51) "...I think it can be political; it depends very much on the character of the individuals concerned and I think it depends greatly on the culture... it was very heavily political and individual directors would fight over what at the end of the day were quite trivial decisions, because it was a part of the posturing whichever one expected them to do..." (1.3, §15)
The perceived importance of technological implementation

Possibly one of the reasons for the unconventional role of Finance is the recognised inability of banks to use financial metrics to fully evaluate technological investments. It was observed that corporate thinking sees little value in fully measuring and evaluating technology because of the uncertainty involved. This stance is directly connected to the way that technology is viewed by banks and, consequently, the approach that banks take in assessing their investments in technology.

"...They are very interested on what return they’re getting for that spend. And they get charged every year a certain percentage of the total technology spend, just for costs of running the business as usual. But every year, each avenue of the business has so much money to spend in terms of technology development. And they control that spend and they decide what they want to spend it on, or what they think is going to give them the most return for money..." (1.5, §22)

"...you can see from our model, we do traditionally just five years but if a project is strategically important, we will have to look at it over a longer term, if it is strategically important. And it’s something that they want to account too, that they will get a return down the line...” (1.6, §48)

That is a key finding of the research, which concerns the established perceptions in the bank as to what technology is, what its value is for the organisation and, thus, how it should be appraised. This research suggests that IT, both technically and strategically, is perceived as an add-on to the existing infrastructure of the bank that will facilitate operations, provide competitive advantage and open new channels for business. The example of how Internet Banking was viewed by interviewed managers illustrates this contention:

"...the rationale behind that [Internet Banking] is obviously that if people do their own banking, and not carrying out transactions in branches, which frees-up capacity in branches, which enables branches to focus on selling, which is what they do primarily in the retail...” (1.4, §2)

"...For Internet based projects like online banking - we’ve got reduced branch staff, a lot of our account servicing can be done online, so that we’ve got reduced overheads there - a lot of it is reduced manual operations, a lot of it is head count based...” (1.6, §37)

One of the reasons that this thinking prevails is, as shown in the interviews, because corporate thinking is focused on increasing value for the firm’s shareholders by increasing revenue margins and business turnover. Because that practical business thinking prevails, attention is given to how investment decisions will contribute to shareholder value (in the shorter term) rather than what is the best way to evaluate technological projects; in that sense, TIDM is seen as an important, but still secondary, activity. For the same reason, investing resources in developing better technological investment processes was also seen as peripheral and unnecessary (see also quote 11, Appendix B):
"...higher management takes a very pragmatic approach and says that the only certainty on this investment, and the only thing approaching certainty, is what we have to actually spend to execute it. The revenue projections they're putting in are guesses. So, what is the point of applying extremely sophisticated and analytical techniques to guesses?..." (1.2, 46)

"...It strikes me that all these intangibles we've talked about and strategic things, you know, are so important in these big investments that being a bit more accurate about the mathematical technique that you are using is a waste of everybody's time and effort!.." (12.1, §44)

As a result, technology is viewed merely as a category of infrastructure as opposed to a bundle of strategic options or a new way of operating; thus any disruptive\(^3\) effect of technology is altogether ignored. Furthermore, the same rationale promotes the view of new IT implementation as incremental improvement of existing electronic infrastructure. In the case of Internet Banking applications, however, that rationale may largely be held responsible for neglecting altogether the effects of Schumpeterian 'creative destruction' and discontinuity of technologies, identified by one interviewed executive:

"...there has been a reduction in value which I am provocatively positioning as a destruction of value as a result of the Internet arriving; probably of the discontinuity which that created as well..." (1.3, §1)

Evidence suggests that traditional financial techniques and established infrastructure performance metrics\(^4\) tend to dominate assessment of technological projects. However, the introduction of new techniques is often subject to change resistance:

"...What we should accept is the general reluctance to accept new techniques. I, for example, developed a different financial control methodology... [ ] ... however, I could not get Group acceptance to it. And what you find is that there will be people who understand DCF analysis and standard Group process, but to change an organisation is really difficult, unless you've got somebody at the top who is a Finance person, and is willing to accept a different form of presentation. This resistance to change regarding analytical techniques is quite big..." (1.7, §43)

Such practice leaves ample scope for justifying technological investments on informal grounds that are more susceptible to political manipulation (see also quote 12, Appendix B):

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\(^3\) The term 'disruptive technology' was introduced by Clayton Christensen (2000) to signify technologies whose implementation had radical effects on established practice by displacing older technologies altogether and, ultimately, by altering the very concepts under which older technologies operated. Examples of such technologies include the PC (which totally altered the mainframe-dominated computer industry) and the latest example of VOIP (Voice over IP) technologies that challenge established telecommunications operations.

\(^4\) Relevant performance benchmarks were often mentioned in interviews(1.7, §39; 2.2, §36; §42; 2.3, §24; 2.5, §22; §38; 5.2, §14), and are also available in the literature (see Steiner & Teixeira (1990) for instance).
"...If not project-specific, certainly in the business as usual terms, you will get people like IT forcing their strategy of moving to a common platform, and using that strategy to shape projects, or to shape the way that business as usual activities are structured. That is quite political. Politics do play all around the place all the time..." (1.8, §53)

"...now, the beginning...takes a lot of convincing because [the firm] is very short-term focused, based on a quarterly basis to justify Internet banking or e-banking; that was very difficult at that time; that's the impression I get from when it started out. Justification is not by the financials by that point in time..." (10.1, §8)

Empirical data suggest that much of the idiosyncrasy in banking TIDM can be explained by looking at banks' organisational structure and culture. That again links to the way that technology is perceived in the financial sector, as well as how this perception is communicated within banks, from the top down. Two observations are made in that respect:

(1) That in cases where TIDM was performed under complex structures, technological decisions tended to remain confined to the business unit sponsoring the project, while the role of organisational departments (Finance, Operations, Compliance etc.) remained external; this promoted a silo mentality where each function was treated more like a black box rather than an integral part of the process.

(2) That the traditional culture of banks – which revolved around the notion of Risk and its management - appeared to permeate the rationales for looking at technological investment: in the investigated banks, the economic appraisal of IT was largely based on applying risk management techniques, as opposed to seeking more efficient ways for accounting for uncertainty.

Despite the spillover effects inherent in IT implementation, the appraisal of Internet Banking applications has apparently most often been made in the absence of any clear or even conscious effort to account for the effects of the project across functional departments or business units (2.2, §30; 2.3, §28; 6.1, §72). That attitude was also occasionally reflected in the use of Post-implementation Reviews (PIR) that focused on tracking only the benefits explicitly defined from the beginning, thus ignoring benefits that were either unanticipated or peripheral to the project (2.5, §44; 3.3, §14; 5.2, §8; 6.1, §46; 10.1, §50). That practice may be seen as one of the sources of benefit miscalculations: because unanticipated benefits occur many times in technological implementation, while anticipated ones are often not fully realised (Primrose, 1991, Hayes & Garvin, 1982), aggregate economic targets may be reached, but on grounds that were not accounted for. Lack of tracking at that stage apparently deprived the firm not only of the opportunity to acknowledge new sources of tangible or intangible earnings, but also of the benefit of a learning device that could inform future best-practice.
"......The project was seen as a 'necessary evil'. We had to get a presence; we had to be able to get applications online. I wouldn't say it was the most coherent strategy to follow. So, there wasn't this kind of PIRs...

"......The PIR itself was cancelled because implementation went fine. Basically the process that we go through from a business point of view to understand how well the projects worked... [ ]... So the feedback from everyone involved in the project was so positive that they decided there was no point having a review, because for the majority of times people have reviews to talk about negative things..." (7.2, §22)

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As shown by the empirical data, this perception of technology as mere infrastructure characterised most of the large incumbent banks. However, this was often not the case for start-up banks\(^5\) where, apparently, structures were more flexible and unstable during their establishment phases, and where technology and innovation strategies were largely coincident with the firms' corporate strategy.

Given the highly political nature of TIDM and the perceived role of technology manifested throughout the interview data, three significant observations can be made as to the actual usage of handbook techniques by the investigated firms:

(1) Apart from very few cases, no tendency was observed for adopting technology-specific investment valuation techniques, despite their abundance in the literature. However, it was not always clear whether this was due to lack of familiarity with available alternative techniques, or whether it was the result of a conscious decision not to invest resources into technique development or adoption:

".....I think this is something that we have started to see as important, but we don't really have the structures in place to do..." (3.3, §49)

"...We're not, [looking to IT-specific methods] to be honest. Not at the moment. Maybe we will need to; probably they haven't been necessary up to this point in time....." (2.2, §54)

(2) Despite the recognised inadequacy of traditional DCF-based methods for TIDM, no example was reported of firms turning to more sophisticated financial valuation techniques (such as Real Options Valuation). (1.5, §46-§49, §79; 9.1, §34)

"...in the sort of business as usual world, and justifying what you’re going to do next year and putting up a business case for the current project as it comes about, Options Valuation is probably not the name of the game...." (1.7, §49)

"...I looked at this model and did a sort of brief research on the basic methodologies like Total Cost of Ownership, ROI, and that kind of stuff, and how they compare. But I think our conclusion is that it is good to look at it to be aware of it, but you need to always apply it to your own company; your own situation..." (8.1, §80)

Different reasons were presented for that: one, that there was no necessity to do so, because, in their view, it is not lack of detail that causes ineffective assessment, but lack

\(^5\) All investigated start-up pure-play banks (Egg, IF, Cahoot and One Account) were set-up after 1999 and thus were considered to be in their development phases when the interviews were carried out.
of accountability and business unit support (2.2, §14, §30; 2.3, §16; 2.4, §22, §52; 8.1, §32, §81). Second, that such change would require action at higher management levels, and critical mass and high level support would be required before that happened. Third, that change in the established order could disrupt the balance of processes and introduce delays that would not be affordable, especially given the required fast pace of TIDM in banks.

(3) The attitude towards appraising technological investments is mainly driven by the traditional quantitative risk-centred mentality, where risk is treated as a measure of uncertainty. According to this tendency, the ability of a project proposition to withstand higher risk is often used as a proof of superior performance.

"...... the hurdle rate is fixed. And it's generated with the CAPM by the group of Finance people. And therefore we have our hurdle rate there; and that's the same for every product and every project that comes on....[ ... but what we can do is to say "well, we can tweak the assumptions within the business world to saying "OK, is this really what's going to happen, change the sensitivities about the number of accounts you're going to get, and how much cannibalisation there is..." (1.4, §24, §26)

According to the same attitude much of the basis for advocating technological investments on the grounds of intangible benefits falls short of quantitative assessment:

"...at the CEO level, there is a general reluctance to accept any quantification of intangibles, because intangible benefits are rarely realised. And therefore, a project that is depending on intangibles in relation to whether it will get a Yes or No decision, the project itself is a marginal project by definition. So what you'll find when people put up their business cases, is that they will declare or state what the intangible benefits could be, but they will not attempt to quantify them ...." (1.7, §19)

It was found that the actual mode of usage of handbook techniques is quite distinct from the one prescribed during adoption of these methodologies. That particular conclusion is one of the core research findings and is extensively discussed in this chapter.

The development and dynamics of expert groups

The discussion up to now has underlined that the reality of TIDM is totally different from that suggested by the elaborate hierarchical decision structures of organisations and the official handbook-prescribed processes. That is despite the fact that these are installed with the intended purpose of addressing and controlling decisions through a systematic, conclusive and homogeneous device. One obvious reason for that disparity lies in the fact that decision structures are most often set-up on the back of existing 'operations silos' (such as departments, functions etc.), to fit the way that the firm traditionally works. Evidence

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6 Again that would lead to the demand for homogeneity of assessment, an aspect that is most visible in large hierarchical financial institutions.
suggests that, far from following these structures, technological decisions are partly the outcome of a process of social construction: what different classes of experts believe about the value of a particular candidate technology ultimately defines the decision outcome (see also quote 13, Appendix B):

"...I am depending on experts in the specific fields; and I will ask each of them independently "are you happy that you can commit to this?" Then, if all of those people commit, I can say "yes, I am happy that I can commit to this, and I believe it will happen". And then it is up to me to prioritise things and present it to the group and say "that makes perfect sense"..." (2.4, §52)

"......you have to have realistic views of what volumes you're going to take up, the question therefore being what the business and the marketing and product directors are believing is going to happen. And, in the longer term, what the IS directors are believing it is going to cost to do this in matching the aspirations of the product manager with the reality that's out there..." (9.2, §29)

This relegates 'objective valuation' of technology to a peripheral, advocacy role as opposed to the determining one that valuation methodologies suggest. This observation links to another pertinent finding from the empirical research: Despite the fact that there always exists a commonly agreed view of the organisation about the role and place of technology in the firm's strategy, Practitioners of different backgrounds and expertise view technological value through different perspectives; it is ultimately their views that construct the aggregate picture of TIDM in the firm through a process of continuous negotiation, whereby expert viewpoints are used to mobilise political viewpoints and legitimise decisions that are purely strategic.

"...[he] was leading this team {IT} and I was leading this team {Operations} and if we could agree on our position, and we usually can, that is a very strong access on which to tackle anybody else in the business. They all have their own power; almost bizarrely, Legal have some more strength than IT, because they can see if a contract is dangerous to the Bank. So, you're going to have to go back and change your operational process, because for example, "we're not defining this or that in the contract, because it will give us trouble". So you'll have to change your process or change your approach or else Legal will say 'No'. Same as Compliance; Compliance can refuse to let a website go up, because it legally or reputationally damages the Bank. So, everyone has their own power..." (1.8, §51)

That expertise-driven disparity of perceptions as well as the existence of power-based decision-making practice was found throughout the interviews in two respects:

1. It was often expressed as a direct opinion that TIDM, more often than not, came down to persuading business sponsors and decision making executives, rather than producing accurate estimates for performance;

"...there are three hurdles you have to get over: one, can I convince people that this is something we need to do? That it fits with our vision; that it fits with our strategy. Two, can I actually persuade them that the numbers make sense? Can I fudge the NPV? And thirdly, can I actually get hold of whatever is the scarce constraint; the scarce resource?.." (1.2, §48)
Georgios Samakovitis  Chapter 7

(2) It was identified within interviewees' viewpoints where the value of technology and its assessment were considered with different dimensions in mind. For that reason, the observed disparity was pronounced, with experts' views reflecting their own understanding of TIDM as witnessed by interviewees (5.2, §14; 7.2, §33 and quote 14, Appendix B) and vividly illustrated in the following quote:

"...the perceptions around investments appraisal definitely have differences of dynamics because the Finance guys say "that's not the bottom line today, and where's the revenue stream?" And the Marketing guys say "That's not giving me anything else to sell to my customers. Where's the marketing line?" And the Customer Services Director says "That's not reducing my number of complaints. Where's the service line?" But the IT Directors say "Actually, if I don't make this investment now, you won't have a service to offer in 24 months"..." (2.3, §35)

The dominance of expert groups in banks has been particularly looked at as one of the determining factors influencing the dominant views on TIDM, largely because the industry's evolution has followed a pattern of expertise development (Fincham et al, 1994). It was expected that the interviewees' opinions on what they saw dominant expert groups to be would reflect their beliefs on how technological decisions are made in their organisations. The main conclusion in that respect was that most executives proposed that there is a shift of importance and, consequently, power to experts that are closer to the consumer end, have marketing experience and are IT-savvy and business-minded7.

".....I think it's more commercially minded people that are more important these days; it's more the commercial focus, which, I think, can be applied to all of those areas. It's certainly something we are trying to bring to our IT managers;..." (2.2, §62)

"...it's senior managers in the organisation who sort of move across from areas, but are responsible for delivering something that is customer-facing. IT, I would say, are less influential at that stage, because the important thing is whether {the product} is bought or not. But often, the IT element of it is quite key... So, more influence, I'd say would be in the Marketing area, which seems surprising in some ways for other organisations that I've worked for, I would have thought..." (3.2, §48)

That IT-savvy, marketing skill set was reported as being the most powerful combination in TIDM, primarily because of the prevailing viewpoint that delivering value to the bank is largely driven by controlling customer behaviour (1.1, §26; 1.6, §53; 3.2, §48; 9.1, §54). That upgraded role of Marketing expertise was often reflected in TIDM practices:

"...suddenly there was a shift; we weren't just looking at the equivalents of FTE savings by driving productivity; we started to look at the customer and how we were

7 There was no unanimous agreement on this view, as some executives identified IT as the pertinent expertise, though not in its purely technical meaning: IT was largely seen more as a necessary part of banking business knowledge, rather than a skillset for performing technical tasks.
going to develop products and services that would change customer behaviour. Not to self-serve, which would help our FTE driver – that was already baked in; but we’re looking at the customer in a different way: how are we going to retain the customer and how are we going to engender loyalty… And suddenly that become an important part of our investment appraisal…” (2.3, §32)

Nevertheless, the traditional banking expertise of financial management and risk assessment was apparently not undermined, as it was reported as being still the one driving business. Interestingly, IT expertise seldom came anywhere near the top ranks of importance and was largely seen as a replaceable skill set that was often outsourced.

“…initially there was a sort of drive to produce a lot of technology in-house. It tends to have moved away from that now and let the experts get on with it - we deal with third party people…” (1.6, §15)

That response was particularly interesting in light of the highly empowered role of IT experts during the late 80s and early 90s (Fincham et al., 1994); that shift of power can be attributed to the changing nature of IT from the specific dedicated banking technological platforms of the period up to the early 90s to generic software applications (such as those based on Object Oriented Programming (OOP)) that were easily transferable across different industries.

Table 7.1: The shifting role of Finance in the 'dot-com boom and bust' period.

<table>
<thead>
<tr>
<th>Dot-com Boom Era</th>
<th>Dot-com Bust Era</th>
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<tbody>
<tr>
<td>Economic lifecycle favourable / high liquidity.</td>
<td>Economic lifecycle unfavourable / lack of liquidity.</td>
</tr>
<tr>
<td>Market perceived IT as growth area</td>
<td>Markets focused on financial returns.</td>
</tr>
<tr>
<td>Intuition and perceptions favouring investment</td>
<td>Stock markets rewarding sustainability</td>
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<tr>
<td>Stockmarkets rewarding innovation</td>
<td>Regulations tightened on performance measures</td>
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<tr>
<td>Uncertainty perceived positively</td>
<td>Perceived uncertainty rationalised</td>
</tr>
<tr>
<td>Focus on market and structural uncertainty</td>
<td>Focus on technological and developmental uncertainty</td>
</tr>
<tr>
<td>Decision-making processes relaxed: “No-Brainer” projects</td>
<td>Decision-making rationalised: Rigorous processes</td>
</tr>
<tr>
<td>Managers perceived market and structural uncertainty positively</td>
<td>Accountability becomes central</td>
</tr>
<tr>
<td>Managers underplayed technological and developmental uncertainty</td>
<td>Managers have a more balanced view of market and structural uncertainty</td>
</tr>
<tr>
<td>Financial measurement under-utilised: Projects promoted on growth/prospect criteria Quantifiable benefits under-represented</td>
<td>Financial measures become rigorous: Role of Finance upgraded</td>
</tr>
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<td></td>
<td>Much attention to quantifiable benefits</td>
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Prevailing views on what the value of technology is and how it should be measured have shifted significantly across the financial services industry throughout the dot com boom and bust era of, approximately, 1998 to 2001. Although this was the case across all industries, some useful observations can be made as to how the role of the Finance function evolved in the UK banking sector during that period. The shifting pattern is broadly reflected in the differences shown in Table 7.1. These are largely based on interview data (1.2, §32,
That pattern demonstrates the evolving nature of the financial valuation of technological investments in a period that was characterised by high uncertainty and where traditional assessment and decision-making functions of the organisation were ‘feeling their way through’ what was seen as strategic investment, rather than providing concrete value estimations for them. Two important observations are made regarding the influence of economic cycles on TIDM:

1. Prevailing perceptions on technological value in each economic cycle influence to a great extent the role of the economic evaluation structure in the firm, namely the Finance function. That influence was vividly illustrated in the dot com boom era when the perceived role of Finance changed from the primary role of valuation and assessment to the supporting one of justification and advocacy of decisions that were made on purely strategic grounds. However, that perceived role reverted to its initial state following the dot com bust, mainly due to firms’ use of rigorous assessments to avoid overvaluations.

2. The power of Finance and Accounting experts in the organisation has been preserved through that transition by relying, not on the ability of their quantitative instruments to classify and benchmark projects, but on the kudos and established understanding of their pertinence in the past.

This discussion up to now has provided an account of the key findings from the empirical data. It is on the basis of these findings that the next sections suggest a conceptual model that elucidates how TIDM is performed in the investigated firms in relation to the prescribed processes and installed decision structures.

The three components of TIDM: a framework for analysis

This section places the findings discussed above into the context of the process-practice dichotomy discussed in chapter 6. To do that, it introduces a conceptual model that looks as TIDM reality as the outcome of the interaction between three components: handbook-prescribed processes; the Installed decision-making structure of the firm; and expert group perceptions. It is stressed that this conceptual model is not a direct description of findings. Furthermore it is not presented as the only possible option for making sense of the findings. It is merely suggesting one coherent approach to explaining how the
perceptions of expert groups interact with prescribed processes and installed decision-making structures to deliver TIDM.

The framework is underpinned by empirical evidence as all three components are, implicitly or explicitly, recognised in interviewees’ responses or overall attitudes. *Handbook processes* develop as the standardised organisational approaches documented in corporate handbooks. They were repeatedly referred to as ‘standard practice’ guides that often embody formal requirements and decision-making criteria. These prescribed processes were most often reported to take the shape of document templates for either facilitating decision-making stages that were clearly describable through standard procedures, or providing detailed checklists compiled from past successful projects.

On the other hand, the *Installed Decision-Making Structure of the firm* reflects the resident view on how the organisation makes decisions. This is disclosed through the common position of managers as to what the aims, scope and strategy of the firm’s TIDM practice should be. It is also visible in the hierarchical structures of corporate governance, as well as in reporting practice. These are shared among most Practitioners regardless of expertise backgrounds and operating roles. (1.2, §20, §22; 1.3, §9, §17) That shared view on decision-making does not relate to knowledge of detailed processes but rather to the prevailing image of TIDM embodied in *corporate culture*. The official Installed Decision-Making Structure for TIDM involves the systems of people hierarchies that the organisation adopts to accommodate decisions in order to ensure control over them. This structure interfaces with handbook processes to justify and prioritise technology projects. It furthermore reflects the official stance of dominant expert groups and the higher management on TIDM and how it should be controlled.

Finally, *Expert Group Perceptions* constitute the raw viewpoints that Practitioners have, as interested experts, about making decisions regarding technology. Such perceptions are often implicit in nature because they are not disclosed as straightforward positions, but rather as the interests that inform the opinions of respondents on TIDM. They are expressed as convictions about the role of Finance, the value of technology, the assessment of intangibles and the power of expert groups; these reflect their understanding of reality as experts and are discussed extensively later in this chapter.

In understanding the particular role of experts, it is imperative that the meaning of *expertise* is briefly explored. Far from being a mere formalisation of knowledge, expertise involves the skills, formal, informal, explicit and tacit knowledge and experience that professionals develop throughout their career (Fleck, 1998; Polanyi, 1966; Nonaka and Takeuchi, 1995). On that account, expertises named by the same terms in Observers and Practitioners spaces are fundamentally different: Academic experts of Finance enjoy a totally different skill set than, say, financial institution managers with Finance expertise. Interestingly, using the term ‘Finance expert’ for both results from the fact that the term assumes distinctive meanings within the two spaces. Most important, as it was discussed in
chapter 2, experts in the Practitioner space act as accountable decision-makers rather than advisors. That distinction of Practitioner from Observer expertise is furthermore assisted by the notion of the ‘reflective practitioner’ introduced by Schon (1983), where the dimension of practical skill acquisition through trial and experience is underlined. These particularities largely condition Practitioner’s specialisation as one of making use of available knowledge and resource to defend and justify their decisions, as opposed to the one of delivering informed solutions as Observers do.

According to the recommended framework, the outcome of TIDM is socially constructed through the interaction between expert group perceptions of the problem. In that process, Handbook processes and the official decision-making structures that are established to control TIDM are subject to these perceptions. That relationship is illustrated in Figure 7.2 through the linkage between three components. The first two, Handbook - Prescribed Processes and the Installed Decision Structure components, are largely formal elements, codified in official procedures or other arrangements. Because of their status, they are communicated as the official practice of the firm for dealing with TIDM. Furthermore, as illustrated by the bidirectional vertical arrow in Figure 7.2 Handbook-Prescribed Processes have a natural position within the Installed Decision-Making Structure of the firm, as formal TIDM tools. On the other hand, the third component - Expert Group Perceptions - are informal and implicit to the organisation. They are only visible to those holding them and the expert groups they belong to. This three-way relationship between these components reflects the social construction of TIDM by suggesting that it is the perception of practitioner expert groups that ultimately defines how technological decisions are taken. This is contrary to the established normative approach of decision-making that expert group perceptions are simply one of the inputs into the process. Instead, this work proposes that Handbook-Prescribed Processes and the Installed Decision Structure are simply formalisations of the dominant views on TIDM, which are shared among Practitioners but are ultimately subject to experts’ understanding and interpretation. Therefore, both Handbook -Prescribed Processes and the Installed Decision Structure merely inform expert groups with a formal framework of processes and hierarchies within which TIDM should be performed.

Figure 7.2 suggests that the reality of TIDM (the component marked as ‘real’ in the diagram) is the result of filtering the ‘formal’ elements (i.e. Handbook Processes and Decision Structure) through the ‘implicit’ element of Expert Group Perceptions. The two ends of the diagram (‘formal’ and ‘real’) effectively represent the process and practice of TIDM respectively, and their relationship conceptualises the process-practice dichotomy introduced in chapter 6. TIDM is constructed by Actors such as professionals and the groups they form,  

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8 The structures defining how these formalisations occur are defined by the Community of Received Wisdom, discussed in chapters 2 and 9.
using official tools (Handbook – Prescribed Processes) within formal configurations (Installed Decision Structures). This model suggests that to assume decision-makers’ actions are simply driven by the demands of the organisation\(^9\) is incomplete.

![Diagram](image-url)

**PROCESS**

- Handbook – prescribed processes
- Installed Decision Structure

**PRACTICE**

- Reality / Outcome

**FORMAL**

- Codified treatments (paradigm-driven & formalised by structures)

**IMPLICIT**

- Perceptions codified within expert groups (paradigm-driven & contingent to professional background)

**REAL**

- Resulting from filtering of ‘formal’ through ‘implicit’ components.

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**Figure 7.2: The three components of TIDM and their relationship.**

Instead, it proposes that their drive for technological decisions is more closely related to serving personal and group interests than to achieving the goals of TIDM that the firm prescribes. TIDM therefore is reached through accommodating decision-makers’ group or individual interests, rather than in spite of them. The extent to which specific interests dominate TIDM activity depends on the relative power position that actors (individuals or groups serving these interests) hold in the firm. Dominance over TIDM is therefore the outcome of negotiation and advocacy between interested groups.

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\(^9\) Organisational theory suggests that managers deliver decisions by acting as problem-solvers in a boundedly-rational manner, by reverting to ‘satisficing’ behaviour (Simon, 1959) when dealing with technological investments. The complementary suggestion here is that experts participating in TIDM are not simply problem-solving entities sharing a uniform understanding of the decision objectives, but interested and informed individuals or groups who ‘satisfice’ within their own perception of the problem.
At this stage, it is important to take a closer look at the three components of this model in order to fully understand how these components and their relationship are related to the empirical findings of the research.

The Role of Handbook – Prescribed Processes

As explained earlier, the term Handbook - Prescribed Processes refers to the systematic recording of TIDM procedures in corporate handbooks. Actual documents like this were disclosed by only a few of the interviewees and were treated in full confidentiality due to the sensitive nature of the information they contained. Despite the limited direct access this research was given to this sort of documentation, Handbook – Prescribed Processes were always referred to during interviews:

"These [templates] are used to make the decision making process, but behind that - behind the scenes - there would also be the different number of tests we do on other models that are to be valued. There's a lot of work goes into before this - this is the end result as opposed to actually what drives the numbers... We also produce the type of business case to go with it (shows paper). Looking at all the options, identifying risks..." (1.6, §35)

"...in terms of the actual investment appraisal, what you're saying is that "we will attract 1000 new accounts/month with this product". But you have to ask the question: "How many of these accounts will be attracted anyway?" because they are existing customers or whether you've actually attracted them with the higher rate. So, you're now looking at the sort of lost income through the cannibalisation of the existing product and the products they would have gained anyway. --- they know that they have to complete a business case; we use a template to calculate NPVs and IRRs based on an Excel spreadsheet". (1.4, §4)

The ubiquity of formalised processes was stated in most interviews (see 1.5, §51; 2.1, §32; 2.3, §40 for some examples) either through more detailed description of processes (2.4, §12) or through simple reference to their central role in prescribing the way that TIDM is officially conducted:

"...But even what templates or forms you draw on during the project are important: we may say "we need to start recording this – fine, there is a form to do that;" and if it works, when we start a new project, we would have a set of them and say "here are the processes we've put in place to manage this project". And it changes year on year; it grows. So that’s the biggest thing I think. Documenting; clearly documenting what you’re doing is always important and storing it effectively." (1.8, §27)

Although the interview data contains extensive references to Handbook – Prescribed Processes and the necessity to formally document procedures, very little, if any, reference was made to the actual financial or other techniques used in them. This is not only true for Practitioners whose expertise is remote from the mechanics of such techniques, but also for Finance experts. Even in the latter case, managers had little knowledge of the available
techniques discussed in chapter 6. As a Finance manager put it, when asked about the use of IT-specific methods:

"..No; certainly not that I am aware of and certainly it's not coming down to the project level. Whether it actually happens at a higher programme level, or even higher, at an executive level, I'm not too sure; I suspect not." (1.9, §40)

"..I've never come across them [sophisticated techniques]. I've worked with a number of financial institutions in the UK and the US. I have never come across any of them. I've come across simulation models – which run Monte Carlo simulations on the NPV, to see what the distribution of outcomes is likely to be, and how robust the conclusion is that this is the project. That is the most sophisticated I've seen." (1.2, §42)

A possible explanation for this lack of attention to techniques is that Practitioners are focused on delivering effective decisions, rather than scrutinising the efficiency of particular techniques (1.2, §46; 1.3, §18; 12.1, §44; 5.1, 23). On that account, they address IT valuation as a practical issue rather than as a theoretical problem. The relationship between Handbook – Prescribed Processes and the Research Approaches discussed in chapter 6 is one of influence rather than direct correspondence, as illustrated in Fig. 6.1.

In the same spirit, the development of handbook TIDM processes is not, for Practitioners, a direct aim of the decision-making process. Instead, codifying processes into handbooks is largely justified by the necessity for standardisation, functional efficiency, homogeneity across decisions and, ultimately, simplification of TIDM processes across the organisation (1.6, §3; 4.1, §65; 2.5, §14; 5.1, §32).

The Role of the Installed Decision Structures

The term 'Installed Decision Structures' is used in this work to denote the formal hierarchical systems that are put in place to coordinate and control TIDM. These include the configurations of groups of people, usually set-up by higher management levels and reflecting the consensus in the firm about how technological decisions should be taken and which operational centres should have a definite say in how such decisions progress.

That consensus was revealed through the opinions of interviewed managers on the role of technological investment valuation in their firm, which can be summarised as follows: interviewees identify technological investment valuation primarily as a mechanism that allows for (1) verifying the viability of the appraised project (1.3, §21; 1.6, §30, §35; 4.2, §34; 8.1, §8); (2) providing valuable input to the final decision-making process (1.3, §27; 1.4, §10; 1.5, §37; 2.1, §26; 2.2., §42; 2.3, §35; 3.1, §34; 4.2, §76); (3) filtering-out inefficient projects and prioritising viable ones (2.3, §33; 2.4, §26; 3.1, §33); (4) ensuring compliance with the wider financial resource strategy of the firm (2.4, §56, §64; 2.5, §42; 3.2, §43; 4.1, §26); (5) justifying the proposed economic estimations (3.1, §37; 8.1, §8; 9.2, §12); and (6) applying a 'health-check' to technological propositions (3.3, §6; 3.3, §10; 5.1, §45; 6.1, §54). These
broad roles of technological valuation were implicitly or explicitly suggested by managers, irrespective of their professional background or expertise. These points provide the broad view of the shared consensus. This is based on the parameters that interviewees said were important to assess in TIDM, the components that typically influence the shape and function of Installed Decision Structures; and received wisdom in the industry on what TIDM should address. This results in a conceptualisation based broadly on empirical data and our interpretation of the generic outlook they offer.

The installed formal view of TIDM is that technological decisions are the outcome of assessment, on the one hand, and the informed opinion of the higher management, on the other. It is suggested that the operational, organisational, and market & strategy functions of the firm inform higher management’s view (just as they do at all management levels); however, higher management is formally recognised as having discretion to influence decisions on the basis of considerations that are not formally incorporated elsewhere.

That broad-brush description is useful for underlining the existence of consensus about how TIDM should be made in broad terms, and suggesting a possible arrangement through which installed decision-making structures reflect formalisations of that consensus. Technological Investment Valuation may thus be viewed as a rational consolidation of the organisational, operational and market / strategy elements with view to making sense of the firm’s goals and offering quantitative expressions of how those goals are to be accommodated at the micro project level. Furthermore, it is suggested that decision-making (rather than economic valuation) is commonly understood to involve the higher management decision function, an opaque and reportedly political process.

Installed decision structures broadly prescribe the agreement observed among managers about how TIDM is formally made in their firm. Managers attend to the installed decision structures in their organisations, while they identify their role to be broader than that of serving the performance requirements set by the Finance function.

The Role of Expert Groups’ Perceptions

The final component that is examined in detail here is that of Expert Group Perceptions. As suggested in Fig. 7.2. Expert Group Perceptions are implicit by nature because the distribution of expert groups in the firm does not follow the organisational structure. Finance experts do not always populate a Finance function; the same applies to all categories of expertise. Furthermore, perceptions are implicit in interviews because they are an inherent part of the interviewees’ intellect. Their existence is not transparent to the perceiver and, as such, it is not directly reported in interviews. Thus, perceptions about technological value and best practice for TIDM are only identified through comparison of viewpoints by the researcher.
To examine expert group perceptions, interview data were reviewed in light of the professional and educational expertise that informs Actors’ viewpoints. An account of interviewees’ backgrounds is provided in Table B.7.6, Appendix B together with the organisational positions individuals occupied in the firm at the time of the interview. Because job titling differs across organisations, expertise cannot be fully identified by job titles; it can only be broadly inferred through the context of the interview.

Broadly, reviewing the interview material in that light provides a picture of the different mindsets that govern the views of Practitioners coming from different backgrounds. The particularities of this disparity are illustrated in Figure 7.3 and discussed in the following paragraphs.

Figure 7.3 illustrates an expert group segmentation that was observed in interviews, together with their perceptions of what their role should be in delivering value to the organisation. This segmentation is practically based on the differences in academic and professional training between interviewees. We should note that, despite being the most pertinent expert groups, the six professional specialities illustrated in the figure do not constitute an exhaustive list. It should also be noted that these viewpoints are also shaped by the positions individuals hold in the firm: Practitioners do not act solely under the professional identity of bankers, accountants or engineers; their main concerns are to perform the tasks that their managerial positions come with. Consequently, the illustrated viewpoints are disclosed in the interviews as mindsets, rather than as fixed positions. We visit these in turn.

The understanding of TIDM from Finance experts was unsurprisingly characterised by a wider quantitative mindset; while it was not suggested that technological decisions should be made on a quantitative basis, their position was flavoured by a preference for thinking of IT projects on a revenue-centric basis, as part of firm-wide investment performance requirements. As such, Finance practitioners addressed technological investments in terms of quantifiable costs and benefits, focusing on translating the effects of technological implementation into quantitatively measurable entities, as illustrated in the following indicative quotes (see also quote 15, Appendix B):

"...The Finance department, in my experience, is doing the sense-checking, I guess, to make sure that what is being delivered, what’s going up to the senior management or the Board for the executive decisions are on purpose and are realistic..." [ ] "...[we are] taking into account the cost of the equity, the cost of capital, whether or not this is an appropriate decision to invest this amount of money, and then compare that with other projects that are wanting to go, like the ones we talked about, banking via telephone and this sort of thing..." (9.2, §15, §23)

"...they have to except certain losses in the initial years; how much of that can be solid; if you’re only expecting to have losses throughout 2 or 3 years or something like that, and then expect to turn then into a profit. Then certainly you also get the overall valuation in terms of how much is this business going to generate over a 10-year or 20-year period, and therefore how much is this business going to generate to the overall valuation of business within [the group]; how much of this is going to be generated to the share price.)..." (9.2, §28)
Similar understandings were offered by Accounting professionals who would very often offer explanations of TIDM reality with the use of Accounting ‘language’. That tendency reflects the manner in which experts’ “view of the world” is conditioned by their educational and professional training (see also quote 16, Appendix B):

“...What we tend to do, it’s just basically based on future expectations and forecasts and for cost saving things, it’s using existing costs and we expect to make X% - it’s an estimate, it’s whether or not you think that’s a reasonable estimate - it’s the business unit’s job to come up with the estimates...” (1.6, §40)

“...Because they treated all of these things in a way that the accounting standard says, but actually you should be treating them this way or that way. This

Figure 7.3: The disparate viewpoints and interests of experts in constructing TIDM.
development that they have done, they had to write it all off to the PLA for that year, because the accounting standards say they are, whereas surely there's some value in that, that they're going to use in 5 years or so. And so you might get adjusted accounts..." (3.2, §24)

Thirdly, Banking experts, despite coming as well from Finance, Accounting and Economics, appear to adopt an attitude that is distinct from other groups in the same area: while their attitude is grounded in the same quantitative principles that inform Finance and Accounting expertise, it regards risk management as the key function of financial institutions. Banking expertise has developed and evolved around the idea of achieving efficient delivery of the management of risk. Unlike the discipline-based character of Finance and Accounting, Banking addresses organisational performance, albeit with the use of Finance and Accounting knowledge. This is reflected in views of Banking experts who look at technological implementation as infrastructure investment that facilitates the bank's operations:

"...Now, in this organisation, and I think it's fairly usual, Finance has a dual role: First of all, it does have a role to protect the numbers. But it also has a role about risk management. In consequence of that, the Finance organisation tends to be a part of all the relevant decision making bodies ..." (1.3, §21)

"...There are some pretty useful, I suppose, risk management and risk quantification techniques you can use to help you actually put a value on that risk. So, you can say 'here is the value of the risk that we're carrying, and here's the value of the investment'. And we do do that; we do quantify the financial value on risks..." (2.2, §44)

Naturally, because of the pivotal role of Banking expertise in the operations of banks, opinions focusing on organisational performance were also expressed by individuals of other expert backgrounds who held high management positions.

"...I ought to say that we're very much perceiving e-banking as a distribution channel, rather than as it were an end in itself. So, we never though for example that we could introduce electronic banking and close down our bricks & mortar network...", (1.1, §18)

"...The main criteria for that – at that stage – was 'let's get the 80% of the customer-facing part of it as professional as possible, and let's look in to see which is the banking system we need to get done; it's an 80-20 rule..." (2.4, §12)

Unlike experts coming from Banking, Finance and Accounting, IS/IT Practitioners share a technical or engineering background that informs their perception of technological value and TIDM; their professional task is most often to design, procure, implement and administer IT propositions, thus focusing on the techno-economic micro level. Even in instances where their professional roles fall outside the purely technical sphere and closer to management, their perceptions are influenced by that background. According to the interview data, despite their tendency to address the tangible side of IT investments through standard measures of performance such as FTEs, IS/IT experts view TIDM as primarily a
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strategic investment. This is unsurprising, as their hands-on involvement in technological implementation underlines the often intangible and unquantifiable nature of IT:

"...we would cancel a project on that because of its specific NPV, but if that moves us towards our strategic intent and would enable us to provide banking services to any third party suppliers, then that's fine, because that will take us to there. We don't have a metric for it; I don't know if that would have at all a point. But, at times, you need to have a bit of faith and do that..." [ ] "...But again in an organisation or our size, you get some big benefits from some big projects; these are kind of 'no-brainers'; it's going to happen regardless. And then you've got another set that are further down the scale, which are making a loss but people will argue on them on a strategic basis. It's got to be a strong argument though." (1.8, §57, §47)

"...You see, Internet banking is very difficult; I don't think the bank now charges for this service, so it's not really profit-making in that these things have a cost. But if it's bringing-in more customers or if it's retaining customers then it's adding to profits..." (1.5, §22)

"...[the bank] introduced telephone banking at the time, everyone was talking about how telephone banking would reduce the cost, the total cost of the organisation, the operating costs, because they thought 'oh well, what we'll do is migrate the transactions from the branch to the telephone'. Of course what it did was change customer behaviour and people did many more transactions.(2.5, §34)

A different perspective is provided by Marketing practitioners, an expert group comprising individuals with disparate educational backgrounds. Marketing expertise in financial institutions is largely located in professional roles driven by specific operational functions (i.e. the Marketing department of the bank). Because of that status, Marketing expertise is often considered within the bank as a skill set acquired through field experience, rather than an academically-grounded speciality like Finance or IT. Interview evidence reveals that Marketing expertise focuses on the customer end and, as a result of that, is interested in technological investment as a way of predicting and controlling customer behaviour (see also quotes 17, 18, Appendix B):

"...... we will try to provide more facilities to our customers online than maybe we've done over that efficiency period; because efficiency has been mainly driven by working internally smarter as possible; but now efficiency and customer service drivers will be how can we remove some of what we do onto the web, so that the customer can do it as well themselves..." (2.4, §13)

"...improved customer service, we also improve our efficiency; it's much more difficult to prove because it means that our customer is not calling us back as much: we're better at servicing customers, so we reduce the number of calls. Pretty hard to measure in the improvements front, but it's more of a common sense..." (2.4, §56)

There was a significant agreement observed between Marketing and Banking experts as to their views on technological value. While this cannot be explained by comparing the areas of interest of those two expert groups, a reasonable explanation is provided by the reported tendency of UK banks to become more customer-oriented, meaning that the interest of Banking practitioners in enhancing organisational performance through customer services coincides with that of Marketing experts.
Last, Legal specialists were considered as an influential part of technological valuation and TIDM. No such practitioners were interviewed, with our understanding of their perceptions formulated through the views of other experts. Legal expertise was seen in interviews as addressing technological investments in terms of the firm’s compliance with regulation (FSA and other), the legal protection of IPR, the legal implications of data fraud, security breach or technical failures. That set of interests defines yet another perception of technological value: that concerning the value of the investment with respect to its legal sustainability (see also quote 19, Appendix B):

“...So, they’re a key member of this core team. And the four main streams on this project were Operations, which was about just about everything, IT, Commercial Finance and Legal ... They worked closely with IT to get the IT costs and the running costs ... and they worked very closely with the Legal people in terms of the detail on the contract. That’s how they formed an integral part of the whole piece and bringing their own expertise into play...” (1.8, §31)

“...Legal have some more strength than IT, because they can see if a contract is dangerous to the Bank. So, you’re going to have to go back and change your operational process, because for example, “we’re not defining this or that in the contract, because it will give us trouble”. So you’ll have to change your process or change your approach or else Legal will say ‘No’. Same as Compliance; Compliance can refuse to let a website go up, because it legally or reputationally damages the Bank. So, everyone has their own power...” (1.8, §51)

That account of six pertinent expert groups demonstrates the existence of different understandings of technological value and, hence, disparate viewpoints on TIDM. The framework provided in Fig. 7.3 illustrates how TIDM is socially constructed through the interplay of experts’ perceptions, assumptions and viewpoints. By looking at these viewpoints in connection to the educational background and professional training that informs them, it becomes more obvious that experts’ perceptions arise in large measure from the theoretical principles of the disciplines relevant to their speciality. It should also be underlined that Fig. 7.3 does not provide an exhaustive list of expert viewpoints, but rather a representative set of the most important ones; experts such as actuaries, for instance, and their understanding of technology play an important role, especially in organisations traditionally dealing with insurance. However, their stance as to TIDM is similar to that of Finance, Accounting and Economics experts.

That descriptive account of expert group perceptions concludes the analytical framework of TIDM reality. That broader framework was introduced to bring the empirical findings discussed earlier into the context of this research’s primary goal: the explanation of the disparities between the prescribed valuation of technology and its practical application. That framework (Fig. 6.1) draws on the linkage between the three TIDM components and proposes that it is ultimately the expert groups’ perceptions and interests on technology valuation that define the reality of TIDM. These perceptions are informed and conditioned by
both the resident handbook processes for TIDM and the shared understanding in the firm of the role of technology. In explaining that mechanism, the components of Common Organisational Practice and the Expert Groups Perceptions were analysed in detail.

Ultimately, what the three component model is useful for is summarised in the following three points: it offers a plausible linkage between handbook and practical approaches to TIDM within the organisation, by introducing a dynamic relationship between the formal documented TIDM procedures (Handbook-prescribed Processes), the internal imposed structure of decision-making (Installed Decision Structures) and the interested views of experts (Expert Group Perceptions); (2) it underlines the social construction of TIDM reality as opposed to the normative view that technological decisions are defined by a common organisational practice where opinions play a distorting role that needs to be mitigated; and (3) it offers a set of exploratory models for identifying the social role of experts in TIDM as the determining factor informing practice.

Summary & Conclusions

This chapter discussed the views on TIDM as developed in the Practitioners space and disclosed mainly through the empirical data. That discussion was largely driven by the observed contrast between prescribed process and actual practice for evaluating banking technologies in UK financial institutions. The chapter started with a thematic analysis of the empirical findings, where conclusions were drawn around three main areas: (1) the ways that TIDM is formalised into corporate handbooks; (2) the official structures of decision-making; and (3) the development and dynamics of expert groups. These findings were then reviewed through an analytical framework based on the three-way relationship between Handbook - Prescribed Processes, the Installed Decision Structures of the firm and Expert Group Perceptions. It was proposed through that framework that the reality of TIDM is the result of filtering installed official processes through the perceptions of expert groups, as these are disclosed in the interviews. On the basis of this framework, the analysis first focused on the ubiquity of prescribed processes, developed to control decisions, and their role as guidelines for TIDM. The discussion then moved to the official decision-making structures that organisations install on the basis of a consensus about how technological decisions should be taken and who should control their progress. An account of the implicit element of expert group perceptions followed. These perceptions were disclosed by examining interviewees' views on TIDM in light of their interests and expertise. The main conclusions from this chapter are summarised here:

(1) Despite the existence of rigorous and scientifically grounded methodologies for evaluating technological investments, these are rarely used – or, even misused -
in UK financial institutions. Decisions on technological investments are carried out, most often, on purely strategic grounds, leaving a supporting justificatory role for the Finance function. Finance thus loses its standard evaluative status in favour of one political advocacy and legitimation. That shift of roles is partly attributed to the effect of economic cycles and especially the changes introduced during the 'dot-com boom and bust'.

(2) Almost unanimously among UK banks, IT is perceived as an infrastructure add-on that assumes only a supportive role in facilitating business. While this is a rational view, it prevents the firm from taking account of the disruptive role and often discontinuous nature of IT that can provide a strategic edge. Because of the same established perception, very limited use of IT-specific methodologies is made, neither is there any observed attempt to replace the mainly DCF-based methods for technological investment valuation; that attitude echoes both the widespread tendency to treat technology as conventional investment and the lack of commitment to allocate resources to improving valuation processes.

(3) TIDM outcomes are greatly dependent on the prevailing opinions of expert groups in the firm and are largely the result of a continuous negotiation process between them, where each viewpoint uses scientific legitimacy, professional status and resident power to advocate for or against different technological propositions. In that dynamic interaction between expert groups, Finance and Accounting maintain their prevalence mainly on the grounds of tradition and resident corporate culture, rather than their ownership of quantitative investment valuation processes. At the same time, power appears to shift towards Marketing-minded, IT-savvy professionals, mainly due to their proximity to the customer-end and their interest in controlling customer behaviour. On the other hand, IT-experts appear to have lost the power role they held in the 90s due to their ownership of core IT infrastructure; this is largely because the shift in banking IT towards more generic applications has turned banking-specific IT into an outsourced resource.

(4) The empirical research suggests that the role of handbook-prescribed processes in TIDM is peripheral rather than central; this observation leads to the proposition that IT-relevant decisions are socially constructed by filtering the official prescribed TIDM processes and their supporting structures through the disparate understandings of expert groups about technological value. It is through the interplay between these perceptions that TIDM reality is delivered.

(5) Six primary groups of professional experts that dominate the area of banking were identified, each apparently playing a determining role in defining TIDM reality. Although this is not an exhaustive set of experts, it adequately covers the scope of educational backgrounds available in the higher managerial levels of
UK banks. Each of these groups views TIDM through the perceptions and interests instilled in them by their backgrounds and professional training. These views are carried by expert individuals as they move through different levels of the bank and hence the relative importance of expert group opinions is defined by their position in decision-making structures.

The description and analytical account of TIDM practice that was presented in this chapter completes the account of Observer and Practitioner Actor classes. That account was effectively a discussion of the pragmatics of TIDM, which introduced the research approaches and methodologies for technological investment valuation (Chapter 6) and the ways that TIDM is socially constructed in the industry field (present chapter). The primary goal of this account was bring to the foreground the disparity between prescribed process and actual practice of technological valuation. That disparity was formalised by introducing explanatory frameworks where on the one hand, handbook processes, together with the official structures of decision-making installed in the firm, play an active part in prescribing TIDM. On the other hand, the actual TIDM practice is revealed not as the implementation of prescribed processes within official decision structures, but as the outcome of experts' perceptions of the TIDM problem and their use of handbook processes and official structures to advocate their perceptions, opinions and interests.

The next stage in addressing the social construction of TIDM requires bringing that process-practice dichotomy into its theoretical and empirical context, and exploring and explaining how it influences the relationship between investment valuation techniques, handbook processes and TIDM practice. Conventional wisdom has it that valuation techniques are practically used as assessment tools, embedded in handbook processes, to evaluate technological investments and that such evaluations explicitly inform the final outcomes of decision-making practice. In the next chapter, a series of observations on unconventional practice (expressed as 'The Anomaly of Practice') will be used to demonstrate that this relationship is dominated by the disparities between process and practice as well as those between the Observers and Practitioners' spaces.
Chapter 8: The Anomaly of Practice: Prescribed Process vs. Established Practice

Introduction

The two previous chapters discussed research approaches to technological investment valuation, the prescribed processes for TIDM and the ways that TIDM is performed in reality. Research approaches are primarily derived from academic treatments of the TIDM problem by numerous disciplines. It was shown that while these disciplines often disagree on how TIDM should be addressed, they adhere to the concept of 'improvable measurement', namely the conviction that better assessment of technological investment can be achieved through more accurate representation of the measured entities.

Chapter 7 presented empirical data to reflect the reality of TIDM in the UK banking sector. Using interview and documentary evidence, it concluded that TIDM as a problem is viewed by practitioners in different terms than the ones used to develop the aforementioned research approaches. The chapter further highlighted the disparity between prescribed process for TIDM and established practice by proposing that, to deliver TIDM reality, handbook-prescribed processes and formal decision structures are subjected to Practitioner expert groups' perceptions and that it is the stance and power position of different expert groups that ultimately influence TIDM. It furthermore suggested that, as regards UK Internet Banking investment decisions, sophisticated IT-specific techniques are rarely used. Instead, the handbook-prescribed organisational processes are still dominated by traditional financial and accounting techniques. Finally, it demonstrated that the wide recognition of the importance of IT is not fully backed-up by practice in TIDM: technological investment valuation functions appear to remain confined to traditional Finance and Accounting expert
groups, with IT investment being treated through uniform investment processes, resident in organisations.

That disparity between process and practice of TIDM is what the present chapter addresses. Because TIDM processes stem from a broad body of academic research on technological valuation, it is widely accepted in industry that they are solidly grounded in scientific knowledge and that their application follows rigorous rationales, clearly defined by disciplines. Therefore, following the research approaches to assessment for informing technological decisions should provide accurate estimates of the economic benefits of technology projects. On the contrary, despite the existence of an extensive body of valuation research, the empirical evidence of this work suggests that practical approaches remain separate from research approaches, without however suffering any obvious disadvantage. That phenomenon, termed the Anomaly of practice, can be phrased as follows:

On the one hand, IT investments are formally detailed into organisational processes that engage all the involved operational units to the decision, and ensure accurate measurement of economic costs and benefits. With particular regard to financial appraisal, a rich body of academic research knowledge is available from Finance, Economics and Accounting, embodied in valuation theories that inform the backgrounds of experts in the Financial Services industry. On the other hand, despite the existence of such elaborate toolkits for Financial Valuation, the stronghold of Finance experts and a resident quantitative culture in the sector, empirical data suggest that most technological decisions are being made largely on strategic grounds. More important, financial appraisal processes are used, if at all, in unconventional ways. Notwithstanding that lack of quantitative rigour, technological implementation is often successful in economic terms. Still paradoxically, the practices leading to such successful decisions are not captured or formally recorded back into formal processes.

This apparent misuse of TIDM techniques and processes only makes sense in its context of practice. It is true that the intended purposes of any tool (artefact or technique) are hardly ever followed unaltered, given their actual use in social context. A tool is either made for use in a practical field directly, or derived by a technique or prototype that is developed as the outcome of research. This disparity between tool development and tool use may offer an explanation of the Anomaly of Practice. It is widely acknowledged that the mismatch between process and practice exists because reality is far more complex and uncertain than can be modelled using the existing scientific tools, so we accept for a fact that managers and scientists do their best in approximating 'satisficing' descriptions of reality as they perceive it.
(Simon, 1955) and, from there, try to deliver usable tools to facilitate what they gather from their experience of ‘best practice’.

This work suggests that this dichotomy between process and practice lies at the centre of understanding TIDM. Addressing the reasons for that disparity will provide a methodological framework for approaching technological investment in more pragmatic terms. In this thesis, it is proposed that the explanation is to be found not in the techniques themselves but in the way they are being used and occasionally misused. For instance, insistence on numerical measures as decision-making tools provides an ambiguous guide for categorising and filtering-out technological projects. What is needed, instead of greater accuracy of quantitative method, is a deep understanding of the implementation context, the economic cycle, the markets’ perception of what the particular technology will offer, and the mechanisms that expert groups reach for when negotiating technological decisions. Ultimately, this discussion will help provide inputs to the ‘question of the value of technology’ as presented in chapter 1, by proposing that value is defined by the perceptions of agents who have an interest in assessing it, and thus inevitably influence the ways that it is measured.

The chapter begins with the theoretical discussion of the Anomaly of Practice, by first presenting the broader stance of Organisational Theories to decision-making and then discussing the disparity between intended and actual use of technological investment valuation methodologies. This discussion is concluded by underlining that the development of valuation techniques, the development of handbook processes, and the actual decision-making are three distinctively different activities. Following that account, a conceptual model is proposed for making sense of the Anomaly and contextualising the preceding observations. In offering an explanation of the Anomaly, the chapter underlines the deficiencies of existing TIDM approaches in both their conceptual framework of understanding and their usage of appraisal and measurement techniques. This shows the need for exploratory frameworks if TIDM is to be addressed in its full dimensions. The Actor-based IGT approach is proposed as such a framework and is discussed in detail in Chapter 9.

The Process – Practice Dichotomy and its Reasons

The organisation’s official approaches to technology investment valuation are formalised by the tools for facilitating choice among candidate new technologies. That official approach plays an active role in legitimising the solutions it proclaims. It does that by objectifying its opinion through appealing to a universally acceptable reference platform; that role is often played by scientific authority. That connection to scientific justification makes the organisation’s official approach a powerful instrument for defending decision-makers’
choices as scientifically objective and protecting them from being accused of judgement errors. It is this point of connection between the pragmatic solution that technological investment valuation seeks to facilitate, and the scientific descent that it relies upon to earn its powerful position, that the following paragraphs address. It is proposed that this relationship is by definition problematic, primarily because of the diversity of the aims that practical problem-solving and academic research training serve. This chapter briefly touches on this problematic relationship by first addressing some of the key underlying points of misfit. A systematic approach for formalising that misfit and, ultimately, for helping to resolve the Anomaly is then proposed.

The academic literature has broadly addressed technological investment decision-making on two levels: Firstly, corporate decision-making practice is addressed as an ordered function of the firm. At that level, decision-making is dealt with in the vast Organisational Studies literature that aims to enhance our understanding of how organisations operate. That research has drawn upon Sociology, Psychology, Economic and Behavioural Sciences, along with Systems Thinking and its derivative branches of Operations Research and Decision Support Systems to look at decision-making in light of both the organisation's status as a self-regulated entity and the individual human participants' interests, power and actions.

On the second, more focused level, established practices for investment valuation are viewed as a means of supporting the decision-making function, by way of making sense of costs and returns of technological investments. That view is supported by a wealth of writings in the areas of Finance and Accounting, focusing on Investment activity and proposing applications of Investment theories in practical fields.

Apparently, the relationship between the functions of investment valuation and decision-making is seldom unidirectional. Given that investment valuation practice is a process internal to the firm, it is shaped by the organisation's overall strategy, and it influences (as well as being influenced by) the balance of power within the firm. That valuation – decision relationship, however obvious, has not been extensively addressed on either of the two levels described above, primarily due to the different disciplinary perceptions of each strand: on the one hand, Organisational Theories turn their attention to the mechanics of organisational decision-making, most often by using empirical evidence to underpin their proposed explanatory models. On the other hand, Investment Valuation theories focus on optimising the measurement of pecuniary value of investments to deliver reliable estimates, on which decisions can then be based. That perceived incompatibility of subject matter between valuation and decision literatures has promoted a separate investigation of the two: each one evolves by drilling down to more accurate detail to improve their models internally, rather than attempting to provide plausible linkages between practical Decision-Making and the ability to use Investment Valuation to facilitate it.
The two research strands of organisational decision-making and investment valuation are central to the discussion on TIDM and the Anomaly of Practice, not only because they represent the main academic attempts to address TIDM, but also because looking at how they approach the problem can ultimately improve our view of the sources of the process-practice dichotomy. The two strands are discussed in the next two subsections.

The view of Organisational Studies on Decision-Making

The study of organisations, as it evolved primarily in the second half of the 20th century, addresses a large number of issues such as organisational structures, the desired modes of operation of organisations and their relations to the social environment. Organisational Decision-making (ODM) has been traditionally perceived as the key focal point in both theory formulation and empirical research attempts in this area: the general belief that decision-making is the organisation's main function, first pronounced by Barnard (1938) and Simon (1957) led scholars from psychology, public administration, political science, mathematical science, economics and other fields to study ODM.

Historically, decision-making in organisations was considered in the context of Economic theories; this was primarily because, until mid 20th century, Economics monopolised the study of organisations in the academic arena. Classical economic theories stress the importance of decision-making through the assumption of perfect rationality of individuals. Later on, advances in a multitude of social sciences, including economics, psychology, organisational theory, political science and cognitive science, have challenged the assumptions of classical and neoclassical economic theory, as regards the explanation of the decision-making process. Extensive theoretical and empirical findings have largely debated the contentions of (1) perfect rationality, (2) perfect information and (3) unlimited computational capacity of the human brain, all implicitly assumed by neoclassical economic theory (Schwartz, 2002; Augier 2001).

In the context of organisational decision-making, rationality is discussed at two distinct levels: (1) the individual agent's rationality, whereby the individual's behaviour, expectations, aspirations and needs are focused on, and where the individual is viewed as an entity, separate in its own right, but subjected to social exposure; and (2) collective rationality, signposted by the effect of the social environment on both individual agents' actions and group-led decision-making (Schwartz, 2002).

These research strands are not the only academic viewpoints on TIDM; they are used here as the strands that most closely address TIDM through different research agendas. That is postulated as the contention that human agents, motivated by economic self-interest, make perfectly rational decisions that maximise the expected utility of their actions: While operating within a wider economy those agents' actions bring about a competitive equilibrium, which contributes in establishing the efficient operation of the market (Smith, 1981).
The debate on human rationality was conceptualised in the work of Herbert Simon, Nobel Prize laureate and scholar of political science, organisational theory, economics, computer science, cognitive science and psychology. Simon's multidisciplinary approach is credited with establishing the relations between psychology and economics (Augier, 2001). His critique of the reliance of practice on perfect rationality can be summarised in the introduction of the principle of bounded rationality: 'the capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behaviour in the real world - or even for a reasonable approximation of such objective rationality' (Simon, 1982, p.204). What underlies this definition can be summarised in three main points.

1. That although human beings may well be capable of reaching perfectly rational decisions when dealing with simple problems, the more the complexity of a problem to which they're exposed increases, the less 'perfectly rational' their solutions become, and the less they achieve maximisation of the utility expected from the solution they give.

2. That when dealing with complex problems, optimality in the results sought by agents' decisions is abandoned for a less-than-optimal (or simply 'good enough') solution (Simon, 2000). Simon coined the term satisficing to describe such behaviour. A partial explanation of this proposition, as provided by Complexity Analysis and Game Theory (Benaroch & Dhar, 1995; Nash, 1950), is that, as more complex problems require the involvement of significantly more parameters to reach optimal solutions, the time, cost and effort required outweigh the available resources, which leads agents to resort to suboptimal solutions.

3. That, because any agent is intendedly perfectly rational, his intended rationality causes him to construct a simplified model of a real complex situation; the agent behaves perfectly rationally with respect to the simplified model, however his behaviour is not even approximately optimal with respect to the real situation (Simon, 1957, p. 199). A decision-maker interprets outcomes according to a simple pay-off function, by categorising outcomes as 'satisfactory' and 'non-satisfactory', and where the boundaries between the two are defined by the individual's aspirations. Consequently, decision-makers operating under this model have to perform less computation that in the rational model, for they are only looking for enough information to find a satisficing solution (Simon, 1955, p. 107).

One of Simon's key contributions, and the one most relevant to this work, is that he pioneered an unambiguous understanding of individuals' behaviour and its contribution to decision-making. The bibliographical works of Gore & Silander (1959) and Wasserman & Silander (1964) illustrate the voluminous, though chaotic and typologically unclassified,
literature on the field that followed Simon's work. Despite the fact that these research attempts drew on a multitude of academic disciplines, most of them were confined within their preset borders. As Pettigrew (1973, p. 5) contends, the most prominent decision-making theories that crossed disciplinary borders were those of March and Simon (1958) and Cyert and March (1963). These belong to the so-called behavioural theories of ODM, i.e. theories that attempt to draw on the reality of decision-making and how it actually happens, rather than prescribe what is ideally expected to happen. We now briefly look at the two behavioural models.

March & Simon (1958)

In the behavioural model proposed by March & Simon (1958) the individual is the centre of the organisation. Human agents are dealt with as "decision-making, problem-solving organism[s] that can do only one or a few things at a time.." (1958: 11) with limited processing capacity and memory. The authors contend that "the interrelation of motivation and cognition must be of central concern for organisational theory" (1958: 135) and criticise previous work for incomplete assumptions on human motivation, for neglecting human limitations on information processing and ignoring the role of influence over individual motivation (Pettigrew, 1973:6). The theory’s main points are that: (1) people seek to *satisfice* rather than maximise the utility of their actions, by reducing the real problem they are faced with to create a simplistic version that can be subjected to simple decisions (Simon, 1955); and (2) there are cognitive limits on rational behaviour. Individuals do not set a utility function and follow it to reach prescribed and well-described goals, and neither are they aware of all the alternatives as they perform decisions. Contrary to the mathematical model of economically rational behaviour (that the authors find to be unrealistic}, individuals construct an approximate and restricted or simplified model and they act according to this; because they often have to make a decision regardless of the amount of information available, or the amount of information that they can process, they necessarily construct and act upon such *satisficing* models of reality.

March & Simon also introduce the notion of *search behaviour* i.e. the proposition that information is not made available to the organisation (and that information acquisition comes at a cost\(^3\)); it has to be searched for and disseminated and thus the alternative options of a decision are discovered as we go: in this line of thinking, the decision itself is influenced, to a large extent, by the search and dissemination process. The authors treat conflict in its problematic sense: conflict is a "breakdown in the standard mechanism of decision-making so that an individual or group experiences difficulty in selecting an action alternative"

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\(^3\) That contention is largely the central postulate of branches of later Economic theories such as *Transaction Cost Economics* (Williamson, 1975).
Conflict is undesirable and thus the motivation for resolving it develops throughout the decision process. For March & Simon, in an organisation there will always be a "felt need for joint decision-making" and conflict will result out of differences in goals between individuals, differences in access to information or differences in how the situation is perceived by human agents. This need for joint decision will be the driving force for conflict resolution.

Critiques of March & Simon's model come from numerous researchers: Udy (1959) contends that March & Simon's work is focused almost entirely on motivation and individual decision, giving the impression that all organisational issues can be reduced to individual activity; they stress (1959:222) that "relatively little attention is given to the social organisation of administration". Similarly, Pettigrew (1973) underlines the model's insistence on placing the individual at the centre of organisational process without paying any attention to how the organisational structure affects the individual's perspective. This, Pettigrew contends, reduces March & Simon's model to being only a partial theory. Further critiques address the treatment of organisational conflict. Shubik (1961) and Krupp (1961) criticise March & Simon's incompleteness of treatment when referring to sources of conflict, as the model fails to provide a clear definition of what the 'satisfactory' options sought are. On the same issue of conflict, Strauss (1962) and Scheff (1961) use empirical evidence to disagree with March & Simon in that conflict is not the result of a need for joint-decision but, on the contrary, the result of an effort of transferring authority from one group or business unit to another. In conclusion, the theory of March & Simon, though one of the very few interdisciplinary efforts, fails to provide a total explanation of the social processes accompanying decision-making, by neglecting or underplaying important dimensions such as the role of conflict and the problematic nature of social interdependence. Most important, the theory ends up ignoring the role of power altogether by considering that it is shared norms, rather than influence and authority which dictate the behaviour of interested parties.

**Cyert & March (1963)**

A seminal interdisciplinary work on the area of ODM comes from Cyert & March (1963). Their theory constitutes a major improvement on March & Simon's model, although it fails to cover many areas of ODM. According to their model, the organisation behaves as an entity, in a way similar to the individual and following the model of the goal-directed, economising and learning individual. The way that Cyert & March derive their model is by adapting the individual learning model into one where the organisation focuses on price and output and seeks decisions by screening alternatives and accepting the first satisfactory alternative with emphasis on reducing uncertainty via standard operational procedures (Pettigrew, 1973, p. 9). The authors inherit from March & Simon the theory of choice and the conception of search behaviour but differentiate their theory by proposing the character of a 'coalition' to the firm and in considering conflict to be a normal process that is neither totally
undesirable nor always successfully resolved (1963, p. 117). In other words, conflict is not seen as a barrier to decision-making and its resolution is not obligatory, and they see organisations thriving even in the presence of a conflict of goals.

Again, critiques of the model come from different sides, including the authors themselves. In the same work (1963), they admit to a lack of explanation as to how the proposed 'coalition' structure is changed through time and, to overcome this, restrict their enquiry's explanatory remit to short-term decisions. Further to that, Pettigrew (1973) observes that little attention is paid to the importance of power which, in turn, leaves little room for explaining "why a particular alternative is raised at a specific time, by whom and with what consequences" (1973, p. 10). Finally, the model is criticised by Soelberg (1963) who observes that Cyert & March propose that organisational goals are made up from departmental aspirations that appear as independent from individuals' goals; that is seen as a rather unrealistic assumption. Overall, Cyert & March's model appears incomplete in its treatment of communication structures and how these change, in its insufficient account of the influence from external parameters, in its lack of mention of the role of organisational structure in decisions and in its insufficient attention to the role of power interests in the definition of goals and alternatives.

Other Behavioural Models

Behavioural models were complemented by later more empirically-based and integrated approaches, especially in the 70s and 80s (Pettigrew, 1973; Mintzberg, 1989; Fincham & Rhodes, 1988) coming from a background of more diffused knowledge of the practical operation of firms and better absorbed cross-influences of academic disciplines.

Of these, Fincham and Rhodes (op. cit.) recapitulate the research work done within the field of Organisational Behaviour and attempt to review the ways that organisations and individuals within them operate in delivering decisions, by bringing together psychological, social-psychological and sociological perspectives in organisational studies (pp. 7-12). The authors readdress the way organisational decisions are taken in three distinct levels of analysis: individual, group and work/organisation. They structure their proposition by using three perspectives (psychological, social-psychological and sociological) to address these three areas. Psychology is seen as most suited to address the behavioural of individuals and the sources of their difference; social psychology is used to address the role of groups in forming organisational decisions; finally, sociology is used to discuss the organisation of work and workplace, social structure, human agency and conflict in firms.

Despite being a well-orchestrated attempt to address organisational decision-making in a complete way, the Fincham & Rhodes approach appears to lack the element of integration. It provides a robust and scientifically-grounded explanatory model for the roles of power, politics, the functions of negotiation and control, the influence of divisions of labour.
and structure, but it does so in a segmented way, by directly applying suitable theories from scientific fields that are often incompatible to each other and whose subject matter and interests are diverse. While this approach allows us to contextualise the function of organisations, it fails to provide a holistic conceptual framework for addressing ODM.

A different perspective, largely based on an analysis by functional areas of the organisation, is provided by Mintzberg (1989). Mintzberg discusses organisations on the basis of seven building blocks which are interrelated in each firm as configurations; these are, Mintzberg contends (pp. 96-98) the result of an adaptive selection that the organisation undertakes to operate effectively by choosing to ‘concentrate on a specific theme’ (p. 96).

The approach proposed by Mintzberg is highly systematic, both in its higher level as well as in the detail of each of the seven building blocks:

1. It recognises six basic parts that are commonly observed in organisations: ideology, the strategic apex, the middle line, the operating core, the ‘technostructure’ and the support staff.

2. In focusing on the role of people, it identifies an extensive set of ‘influencers’ of an organisation, or actors who either directly participate in organisational activities, or indirectly contribute to it or influence it.

3. In addressing the systematisation of work activity in the firm, Mintzberg proposes six coordination mechanisms as the basic elements of structure.

4. In regard to organisational design, the approach identifies nine parameters that determine the division of labour and facilitate coordination. He uses the term design parameters for these.

5. Mintzberg proposes that a set of hypotheses govern as universal empirical rules the selection of the design parameters mentioned above. These broadly concern (a) the age and size of the firm, (b) its technical system, (c) its environment and (d) the structure of power.

Mintzberg views decision-making as a function primarily concerning the Professional and Political attributes of the organisation (op. cit. pp. 184-187 and 249-250), although he proposes that relevant decision-making dimensions concern its Entrepreneurial facet (op. cit. pp. 118). That approach involves a framework which reflects three different levels on which organisational decisions are made (op. cit. p. 183):

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4 Mintzberg distinguishes between (1) the Entrepreneurial Organisation, (2) the Machine Organisation, (3) the Diversified Organisation, (4) the Professional Organisation, (5) the Innovative Organisation, (6) the Missionary Organisation and (7) the Political Organisation. Each represents a basic attribute of the firm that appears in each configuration (i.e. in each specific corporation).

5 Mintzberg uses the enumeration of agents as an instrument for providing a complete account of influencers. He does not use his classifications as the centre of his analysis, as happens with the Actor-based IGT approach.
(1) by *professional judgement*, where individual professionals function as trusted representatives of the firm, because their training ensures that their decisions are generally accepted in their professions,

(2) by *administrative fiat*, where certain types of decision are easily revertible to a mechanistic action of conventional bureaucracies,

(3) by *collective choice*, that is through combined effort of professionals and administrators, especially in the instances of programming, staff promotions, development of processes etc.

Mintzberg’s frame of understanding is highly analytical and solidly based on empirical evidence, thus avoiding the risks of reverting to theoretically-driven models of organisations. It further proposes the conceptual framework of *configurations* as unique formations of how the firm’s attributes interrelate; that provides a high-level description of the organisations’ operation and is thus useful in making sense of the components that Mintzberg addresses in detail.

Despite being probably the most complete and coherent model for organisations and their management, Mintzberg’s approach can be criticised for proposing a universally applicable slicing of a firm’s functional entities and subsequently allocating particular functions to these in a compartmentalised fashion, neglecting the organic nature of in-firm activities. Second, in his model for enumerating *influencers*, Mintzberg proposes a static role for groups of actors and further implies a static composition for these groups; that stance does not take account of the evolution of interests, the role of expertise and the largely dynamic nature of decision-making. Thirdly, in providing a categorisation of coordinating mechanisms, Mintzberg assumes a static model of operation for organisations and, in so doing, presumes uniform response of firms and individuals to these coordination mechanisms. Overall, one may contend that Mintzberg’s is a highly systematised approach to organisational function, and being that, it is necessarily trading-off between detailed description and wider applicability.

**The New Institutional Economics**

An alternative to Organisational Behaviour’s stance to decision-making is found in the contributions from Economics, as they evolved through the 20th century. Contrary to what Organisational Behaviour literature proposed, Economics has historically given (and still gives) an economic interest-based perspective to decision-making. According to these views, in-firm cooperation, interactions between professionals and groups and actions relevant to organisational decision-making at large are reduced to self-interested economic behaviour.
The traditional microeconomic view addressed the firm as a production function and market failures (i.e. the departures from market exchanges) as inefficiencies diverting from an ideal type of market exchange. Later advancements in economic theory reviewed the problem of in-firm cooperation (Moe, 1984) and the need for responding to it, by viewing organisational activity, including decision-making, through contracts as incentive systems and monitoring mechanisms. That approach is represented largely by New Institutional Economics, a research stream initiated in the 1970s. Nilakant & Rao (1994) in a review paper refer to the branches of New Institutional Economics, as summarised in Figure 7.1.

Of the two main streams, Transaction Cost Economics focuses on ex-post institution of contracts (Williamson, 1975). It proposes that markets and hierarchies in firms are alternative modes for organising economic transactions. That is, the firm is addressed as a mechanism for minimising transaction costs; such minimisation is achieved by reducing the costs of computing, composing and enforcing contracts. The other stream, Incentive Alignment, is concerned with designing contracts as means of securing against contingencies (Nilakant & Rao, 1994) thus taking an ex-ante approach to contracting. The two sub-branches of that stream are:

![Figure 8.1: The taxonomy of the New Institutional Economics literature (Diagram derived from Nilakant & Rao, (1994)).](image-url)
(1) Property Rights, represented in the works of Alchian (1965), Demsetz (1967) and others, treats new types of property rights as attempts to overcome the inefficiencies of older and more simple forms of contracts.

(2) Agency Theory, focusing on the so-called agency problem based on the contention that agents (managers) of the firm have the opportunity to act contrary to the interests of principals (owners) by misrepresenting information and using resources to their personal use (Jensen & Meckling, 1976). According to the proposition, the task of the organisation is to design appropriate monitoring mechanisms and incentive schemes, through contracts, to mitigate that misconduct and minimise the related costs.

While the Property Rights stream has not had a significant impact on later research, Agency Theory has been widely embraced and two sub-areas have developed: Positivist Agency Theory; and Principal-Agent Research. The former looks at the agency problem in the perspective of the ownership-control separation and investigates the labour and capital markets as mechanisms for controlling the manager-agents’ behaviour; that stream is famously represented by the works of Fama (1980) and Jensen (1983). Principal-Agent Research adopts a different focal point and, unlike Positivist Agency Theory, takes the agency problem and its consequences as a given fact. Instead of investigating the mechanisms behind it, it seeks to design contracts to prevent misconduct (Baiman, 1990).

The criticism of New Institutional Economists has largely been grounded on their theories’ lack of accounting for the effects of power and other social dynamics (Perrow, 1986; Jones, 1983), the ‘embeddedness’ of economic actions in interpersonal relations and their effects (Granovetter, 1985; Stinchcombe, 1986) and the proposition that the idea of firm hierarchies resulting from market failures is unrealistic (Boisot & Child, 1988; Eccles, 1985).

The field of Organisational Studies takes a distinctive approach to addressing decision-making, seeing it primarily as the result of human activity based on identified norms of behaviour within the organisation. Such norms are addressed in either their sociological and psychological dimension (as happens in Organisational Behaviour), or their socio-economic context (as happens in Economics). Organisational Studies also often discuss decision-making by dealing with the organisation as an entity on its own right that ‘makes decisions’ through conditioning and institutionalising individuals’ behaviour. Other attempts (see Fincham & Rhodes (1988) for an example) attempt to address the individual, group and institutional dimensions of decision-making by aggregating older theoretical contributions to explaining behaviour at these levels.

The approaches provided by Organisational Theories - both of Behavioural and Economic background - focus primarily on deriving explanatory models for in-firm operation but do a rather limited job in addressing the specific problem proposed by the Anomaly of
Practice. This is possibly because the adoption and use of valuation methodologies has traditionally been treated as a natural part of the established TIDM processes and was considered to be the remit of Financial Investment Valuation and Accounting. In addition, the problematic of technological value has only recently gained momentum through the strong empirical evidence of valuation failure for new technologies, despite the long existence of the IT Productivity Paradox. The discussion now turns to the disparities between Investment Valuation processes as they are supposed to work, and the pragmatics of their implementation.

Other Theoretical and Practical Antecedents of the Dichotomy: Investment Valuation Practice

The disparity between the applied theory of investment and its practice in TIDM is the first point where the origins of the dichotomy may be sought: Investment as a concept signifies the allocation of financial resources of the firm in a manner that ensures that the returns will outweigh the value of the allocated resources in the future. Hence, investment valuation refers to the estimation of these returns at a specific point in time. The immediate limitations stemming from this brief definition is summarised in three main points: (1) that the monetary value of the allocated resources is difficult to estimate with precision, even after the investment; (2) that value does not always have pure or direct monetary connotations; and (3) that the life of an investment is, in most cases, difficult to define, thus making calculation of the allocated resources’ value hard, even long after the project’s initiation. These points demonstrate that evaluating an investment is an inherently complex process, even when this is done long after the project is finished and its benefits are visible to the firm. This is because predicting the future performance of a project is a notoriously difficult task, primarily due to the existence of uncertainty. Broadly speaking, the task of investment valuation relies on a complex web of activities, through which the firm defines the target outcomes of the project, develops a number of possible scenarios of action, appraises all scenarios against each other and ultimately chooses the most favourable scenario to implement.

The existence of uncertainty in these stages has numerous implications with regard to practice. Firstly, the number of possible available scenarios of action may change during the course of the project, as new viable opportunities emerge or existing ones disappear due

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6The terms Valuation, Evaluation and Appraisal are often used interchangeably in the literature. I distinguish between evaluation and appraisal where the former signifies the ex post valuation of an investment and the latter signifies the ex ante estimation.

7Again, with the exception of investment in securities, most projects may well require additional investments to ensure viability of the initial investment, meaning the life of the project may far exceed initial estimations.
to unfavourable economic or other market conditions. Second, deriving and detailing the value of any future scenario can be subject to mere guesswork, as it is impossible to predict and assign values to all contingencies that may occur when implementing a hypothetical scenario. This, in turn, makes comparison of available options even more ambiguous. Third, once the decision to implement a project is taken, and the project is underway, the resources invested are uniquely allocated to the specific project in an irreversible manner (Hayes and Garvin, 1982). Uncertainty of outcome in such a project means that, if conditions for the project implementation become extremely unfavourable, the time and money already spent on it cannot be re-allocated to the next best project.

Investment appraisal has traditionally been the subject of the discipline of Finance, and, by association, that of financial experts within the organisation. The Finance function attempts to appraise the economic feasibility of projects through calculating cash flows generated during and after the project (Brealey and Myers, 1996; Brigham and Gapenski, 1997). In pursuit of that goal, a large number of financial techniques have been developed to achieve accurate calculations and to incorporate investment particularities such as the time value of money, the opportunity cost of capital and irreversibility. Contingencies have also been historically subject to treatments of financial techniques, as these were identified in practical fields. The focus of financial techniques is the translation of all such particularities in quantitative terms. Clearly, project uncertainty could have an impact on the accuracy of financial techniques for investment valuation. A number of observations can be made in this respect:

(1) Cash flows used in financial techniques are derived as a result of the interpretation of the appraisal team: managers’ self-interest may be reflected in financial appraisal results, signifying an additional level of uncertainty of outcome.

(2) Cash flows can themselves be uncertain: Calculation of sums is done under assumptions that cannot account for parameters that are yet ‘invisible’ and which may have positive or negative effects on the project’s final outcome.

(3) Not all parameters may be clearly quantifiable and thus inserted in financial calculations, and therefore financial appraisal forms only a part of the overall appraisal process.

(4) Even where it is possible to quantify most parameters, the effort and resource necessary for doing so may well outweigh the resources made available in the organisation for this task.

(5) The cost of identifying and measuring costs and benefits of a project may well exceed the benefits expected to come from doing so, which makes the whole exercise unviable. In this respect, the investment appraisal process itself is subjected to uncertainty.
These observations suggest that there are considerable limitations in modelling investments under common quantitative parameters, as these are set-out by the Finance discipline. Sources of these limitations can be sought in the historically established monetary context of the very meaning of investment, wherein mathematical representations of return and risk dictate – in some cases on their own right – which investments are profitable and which are less so. In that respect, a number of problems exist as to how financial appraisal can contribute to assessing the value of investments to the firm.

To begin with, the definition of risk itself introduces two main assumptions to financial appraisal practice: that because return is notionally linked to risk, the investing firm can adjust its expectations to higher levels of returns to mitigate high investment risk (by adjusting hurdle rates); and that taking account of risk in its mathematical sense is a suitable proxy for taking account of uncertainty.

Working through the first assumption, one may contend that accepting it implies that the firm can undertake a high risk project, provided it can justify returns higher than or equal to those given by the relevant risk-return equations. However, this assumption does not propose any explicit upper limit to acceptable risk, neither are the involved rates of return relevant to the specific business environment; they are rather directly derived from general formulae, developed to reflect generic forms of financial investment. Furthermore, the risk-return relation is used in practice in lieu of a proxy to indicate that a project can withstand significant levels of risk, and therefore it is safe to undertake: instead of measuring risk and deriving from it the acceptable rates of return, managers will often test their business cases against higher expected returns to prove that their project will deliver benefits, even under adverse and risky conditions\(^8\). However logical, this practice does not really reflect the rationale of the underlying financial calculations since it simply relies on hypothetical conditions or desired targets that it tries to justify by promising higher returns.

These points have great relevance to the second assumption i.e. that risk can be used as a measure for uncertainty. Because the common perception is that uncertainty is inherently negative and that reducing the time span of a project is a suitable countermeasure for avoiding uncertain outcomes, managers often resort to the practices described above to provide against it. What is not accounted for, however, is that despite the fact that risk is the result of taking actions under uncertainty, uncertainty has both positive and negative connotations (Lefley, 1997). In addition, uncertainty suggests an infinite number of future alternatives on grounds that cannot be identified at all, and thus cannot be defined in the

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\(^8\) Evidence suggests that managers will often promise quicker payback of a project by increasing expected rates of return (or hurdle rates (Lefley and Sakris, 1997). Again, instead of estimating an expected rate of return and, from it, calculating the expected payback period, they adjust expected return rates to match the desired payback time.
probabilistic terms that risk uses. In that sense, even using risk as a proxy for negative uncertainty is inappropriate.

Additional problems with financial appraisal stem from established organisational perceptions about what it can or cannot deliver. Based on a pressing demand for robust business cases, managers often tend to emphasise numerical measures of business aspects that can be inserted in financial calculations and thus provide tangible measures of expected costs and returns. While this practice is rational, it promotes an over-reliance on figures that, in turn, shifts managers' focus towards directly quantifiable costs and benefits, leaving aside those that are either intangible or hard to quantify. This practice promotes a less than complete view of aspects of the overall investment.

A final, but not less important, drawback of standard financial appraisal practice is that of short-term focus (Ashford et al, 1988; Narayanan, 1985). Because uncertainty is higher for projects of longer duration, estimating expected returns from financial formulae is much harder for such projects. Furthermore, because of the importance given by top management to financial measures, managers develop a tendency to promote their projects on grounds of short-term returns, as these are illustrated in financial appraisal calculations. The composite effect of this is that projects with longer-term scope de facto become less favourable on the grounds of inadequate or ambiguous financial justification.

The primary observation from this discussion is that there is a fundamental aspect of the disparity between TIDM process and practice that the literatures of Organisational Studies, Institutional Economics and Finance have not explicitly addressed: the overwhelming presence of accountability and responsibility permeating the decision-making practice that is absent from the development of processes. It is the same characteristic that was originally used to distinguish between Practitioners and Observers early in the thesis as decision-makers and advisors of TIDM respectively. In the presence of that accountability, political interests in corporate decision-making are prominent in the Practitioners' space: Managers are motivated to collude and cluster into interest groups to defend their position when accountable for undue practice. This key aspect is more clearly addressed in the section that follows.

Three additional observations are drawn from the discussion. The first is that the aims of technological investment appraisal are distinctively different from those of investment appraisal as an application of technique. Whereas the former is used to inform the choice of technology in the context of the firm with view to enhancing its value, the latter is a tool for assessing comparable investments outside the organisational context. Second, the TIDM activity and the process of technological investment appraisal come from different backgrounds. Decision-making is a pragmatic task while investment appraisal is a theoretically ascertained process for legitimising decisions. Thirdly, because turning techniques into formal tools is inevitably mechanising a part of the decision process,
potential for mishandling is created. This is because mathematical tools are turned into proxies for justifying organisational decisions that are 'soft' by definition.

This discussion has achieved two goals. First it surfaced the fundamental difference between, on the one hand, making decisions and being held accountable for them and, on the other, developing frameworks or providing solutions to a problem, on an advisory or practical basis. It did so by focusing on academic traditions that deal with decision-making and investment valuation and then demonstrating that these disciplines leave a research gap in investigating the relationship between prescribed processes and established practice. Second, it stressed the disparity between the problem-solving nature of corporate decision making and the authority-laden nature of processes and techniques that are put in place for facilitating it. The probable sources of that disparity are identified in the diverse roots of the two functions: Corporate decision-making is a practice necessitated by the everyday activity of the firm and, hence, an enterprise that is informed by specialised knowledge as much as by common sense and experience. Because of its complexity, decision-making necessarily calls for supporting mechanisms, such as tools, processes, hierarchies and structures that simplify and facilitate it. Investment Valuation techniques are supporting mechanisms and, as such, they are grounded in scientific legitimization. They assume a facilitating role for decision-making because they can function as proxy for scientifically justifying decisions. They are furthermore historically favoured as prime decision-making tools because of their direct linkage to numerical representation and mathematical rigour (Porter, 1995), which are properties that appeal to the human brain as decision criteria. This linkage is closely connected to their academic ancestry from the quantitative disciplines of Economics, Accounting and Finance and, by association, to the stance that their scholars have established in the past.

**Purpose – Output - Structure – Expertise: disparities between development and usage**

The previous section demonstrated that the disparity between established process and practical application arises from the different aims of the Actors who develop processes and those who use them to inform their decisions. The present section uses a systematic approach to explain that observation further, addressing it on two levels: that of the process-practice dichotomy and that defined by the distinction between Observers and Practitioners. That approach is depicted in Figure 8.2.

The model is derived by looking at the relationship between valuation methodologies, largely developed through academic and industry research in the Observers' space, handbook-prescribed processes developed in organisations (i.e. the Practitioners' space), and the established practice of TIDM. It reflects the distinction between three
cognitive activities relevant to the social construction of the TIDM problem: the development of valuation methods; the development of handbook-prescribed processes; and the use of these processes in decision-making practice. That distinction was markedly visible in the empirical data, as the following example illustrates:

"...I've never come across [sophisticated techniques]. I've worked with a number of financial institutions in the UK and the US. ... I've come across simulation models – which run Monte Carlo simulations on the NPV, to see what the distribution of outcomes is likely to be, and how robust the conclusion is that this is the project. That is the most sophisticated I've seen..." (1.2, §42) [ ] "...So, yes, people do play with the discount rate. You have to remember that the average person who is doing these appraisals has not been through an MBA programme. They struggle to understand the basic NPV. They know how to do an NPV calculation on an Excel spreadsheet and that's it... (1.2, §44) [ ] "...And yes there were specialised models and methodologies to calculate NPV or IRR and so on, but as you know yourself, you can fudge those numbers to present any answer you want. And with a plausible set of numbers, and IT resource available, you can get it out... So you were, to some extent, telling a story in getting approval to implement something like this..." (1.2, §36).

The construction of the model begins from the already mentioned observations about the different scope and practical significance of the development of techniques, their application and the decision-making activity. These observations are summed up in the following points:

1. The development of technological investment valuation techniques is a process that largely takes place in the Observers' space (Universities, government bodies, consultancy firms) with the purpose of constructing reusable evaluation tools for dissemination of academic knowledge (in Universities), policy-related decisions (in government bodies) or commercial exploitation (in consultancy). In that respect they are largely the outputs of Observer organisations.

2. The development of handbook-prescribed processes is an intra-organisational, local activity that aims to facilitate control of TIDM processes and streamline decisions through the hierarchical levels that the management considers important. As a result, handbook-prescribed processes do embody elements of valuation techniques, but they constitute the controlling mechanism for decisions, rather than the assessment instruments.

3. The ultimate decision-making activity per se is a cognitive process where both valuation techniques and handbook-prescribed processes are treated as mere resources. The TIDM activity takes place with the purpose of delivering a solution that is accepted as satisfactory by the firm's dominant expert groups, the Board and, more implicitly, shareholders. Practitioners who deliver decisions do so in the knowledge that they are accountable for them and thus make use of handbook processes and valuation techniques to validate their choice.
In its detail, the model addresses the composition of these activities through four dimensions: purpose, structure, expertise, and the outputs resulting from these activities. (I shall in future refer to this as POSE for Purpose, Output, Structure, Expertise). The selection of these dimensions and their usability is discussed in more detail in the following section.

The POSE model's contribution to addressing the Anomaly of Practice is that it provides plausible explanations for the use of research approaches in the industry, the conditions under which they are embedded in handbook-prescribed processes in organisations and the reasons behind their unconventional use in TIDM practice. Furthermore, by revealing the mechanics of that practice, the model illustrates how the difference in mentality and interests between the worlds of Observers and Practitioners prevents formalisation of TIDM into normative processes and reusable knowledge. The model is explained below.

**The model**

The POSE model suggests that each of the three activities can adequately be represented as a configuration of (1) the purpose of the activity, (2) the structure wherein it takes place, (3) the expertise of Actors who perform and own it and (4) the output they produce. Using these dimensions allows us to focus on pertinent elements that describe the three activities: They take place with a purpose in mind, as that is defined by the implementing organisation. Because they are specialised activities, they are performed by
experts and, as a result of that, experts maintain ownership of them. Finally, the context of these activities is defined by the organisation and its stated interests and objectives. However suitable for the purpose of this discussion, this is far from a unique descriptive model. A representation of the POSE model is provided in Figure 8.3.

Figure 8.3: The Purpose – Output – Structure – Expertise (POSE) model used to represent the three cognitive activities (technique development, handbook process development and decision-making).

Each cognitive activity is represented as an oval; 'Structure', signifying the organisational environment wherein the activity is performed, is depicted as the coloured background of each oval. 'Expertise' and 'Output' lie on this background. The arrow from 'Expertise' to 'Output' is used to signify that experts, as owners of process and knowledge effectively produce the outputs of each cognitive activity. Finally, 'Purpose' is attached to 'Output' to demonstrate that 'Output' serves particular intentions for which the cognitive activity takes place.

The analytical framework presented above describes each of the three cognitive activities relevant to TIDM. The model suggests that the Purpose – Output – Structure – Expertise 'mix' of each of the three cognitive activities is distinct from one another. This disparity is discussed here as a possible reason for the disagreement between research, handbook and practical approaches to TIDM, and is ultimately proposed as the explanation.

Cognitive processes have long been the subject of relevant research fields such as psychology and cognitive science.
Using the POSE model

To apply the POSE model for explaining the relationship between the three cognitive activities, we begin by considering each of them separately and then discuss how they are linked to each other. This will provide a complete picture that clarifies the ambiguities that the Anomaly of Practice introduces.

The development of valuation techniques

The discussion begins at the Observers’ space, where the development of technological valuation techniques is reviewed. In this case, the stated purpose is the production of techniques for assessment of technological investments. As far as academic research is concerned, there is significant disparity between the aims of the hosting organisation (University or research organisation) and those of Actors participating in technique development, despite the fact that these aims are not necessarily conflicting. In contrast to the stated purpose, Actors themselves develop techniques to either contribute to their research publication record\(^\text{10}\) or achieve economic benefits from using techniques on a consultancy basis. That professional attitude of Observer-Actors can partly be held responsible for the continuous proliferation of techniques in the academic and trade literature.

The Outputs of the cognitive activity are the techniques themselves. These are delivered as the outcomes of academic or industry research, as reusable frameworks. These are most often made available through specific implementations on particular valuation cases (as, for example in academic papers where real life cases are used to demonstrate how a framework functions).

The organisation hosting the technique development activity assumes the role of the Structure in the model. Universities or other research outfits, government bodies and consultancy firms constitute the environment, together with its conditions, restrictions, interests and objectives wherein technological investment valuation techniques are created. Structure influences that cognitive activity directly by providing the official context and reasoning for it. It also influences it indirectly through its implicit goals; such as the case of academic institutions seeking particular publication strategies or consultancy firms seeking maximisation of profit.

Finally, with regard to the same technique development activity, Expertise refers to the intellectual specialisation of academic or industry researchers, who effectively own the

\(^{10}\) This reflects the standard established process for assessment of academic achievement.
technique development activity. It is through their perception of the TIDM problem that techniques are created and tested. Different types of expertise achieve results which are equally legitimate and acceptable within the academic traditions or research strand that experts subscribe to.

Technique development as a cognitive activity has been the subject of extensive research in the past, mainly in the field of the sociology of knowledge (Law, 1973; Kuhn, 1962; Ravetz, 1971; Giere, 1988). In the present context, that activity is addressed as a structured process with a view to identifying how techniques interface with the other two cognitive activities in the Practitioners’ space. The overall conceptualisation through the POSE model helps to underline that the form and context of Observers’ techniques, as well as the professional roles of experts who own their development, is very particular to their stated and implicit purposes.

The development of Handbook Processes

The development of handbook processes is quite distinct from that of technique development. This is not merely because of the disparities between the Practitioners and Observers spaces; as will be demonstrated in the discussion of decision-making activity, it is also because of the demarcation between process and practice.

Handbook process development aims to provide a structure to TIDM in the shape of procedures that ensure that specific departments provide adequate input to the decision, that particular expert group representatives participate and sign-off any TIDM plans, and that progress can be traceable at any stage of the procedure. Those aims were quite vividly described in interviews, where detailed descriptions of handbook processes were provided as the standard approaches of firms to TIDM (see particularly interviews 1.6, 1.7, 2.4, 2.5). In conjunction with indications from the same empirical evidence that handbook processes are not definite recipes for TIDM but mere generic guidelines, the purpose of handbook processes is the control of decisions, rather than the full assessment of candidate technologies.

Secondly, the Outputs of handbook process development are the formal processes themselves, as documentary guidelines, frameworks or checklists, namely any form that can be sufficiently communicable and usable by Practitioners.

Thirdly, Structure in handbook process development is the hosting financial institution and its wider objectives, resident hierarchies and interests. In a similar manner to the Observer organisations, financial institutions condition the development of handbook processes by embodying their formal objectives into them. That practice is reflected in formal processes that require TIDM to take place through specific stages, each signed-off by particular departments or individuals.
Finally, Expertise in handbook process development reflects not only the formal knowledge, specialisation and experience, but also the knowledge accompanying the professional roles of Actors who participate in it. Practitioner experts assigned to the task develop processes as the output of their professional roles in the firm while at the same time applying their expert knowledge on technological valuation to embed relevant assessment techniques into these mechanisms. Expertise provides the background knowledge that defines how the particular professional task of process development is carried out. In that sense, expert-Practitioners maintain ownership of the activity as the individuals or groups who possess the skill and specialisation to perform it.

This discussion demonstrates that handbook process development is a cognitive activity distinctively different from the technique development that takes place in the Observers’ space. This is not only because handbook processes are constructed with a different purpose in mind, but also because expert owners of the activity in Practitioner organisations have specialisations, experience and professional roles that are different from both that of Observer experts (as technique developers) and from that of Practitioner experts as decision-makers. Most important, despite the fact that handbook processes embed valuation techniques as assessment instruments, the two are completely different in nature and context as outputs of totally different cognitive activities.

The decision-making activity

The third, and most complex, cognitive activity is that of practical decision-making. TIDM practice, i.e. the way that decisions are ultimately taken, has not, in its essence, been prescribed through normative procedures to date. Organisational studies, Economics, Behavioural Sciences, Psychology and Cognitive Science are just some of the disciplines that have dealt with decision-making, without providing definite rules about how decisions take place, even in very specific settings. What is particular about the practice of making decisions is that Practitioner experts who are involved in it are ultimately accountable for them. In light of this observation, the outcomes of TIDM are addressed in this research through the Actor-based IGT framework as the socially constructed outputs of an implicit negotiation between expert viewpoints, informed by their educational and professional backgrounds and conditioned by the necessity for legitimation and justification.

Using the POSE model to describe the TIDM activity elucidates the relationship between process and practice in the Practitioners’ space. The decision activity’s purpose is to deliver a solution to the question of whether a particular investment should be preferred to rival options. That is a solution legitimated by quantitative assessment and, in the main, based on the judgement and perceptions of Actors who participate in it. In other words, the purpose of the TIDM activity is to reach a usable, informed agreement defendable to all interested parties (the Board, expert groups, shareholders etc.) on rational grounds and that
can then be followed as an informed guideline for implementation of the selected technology. That usable agreement is also the output of the TIDM activity.

Second, the Structure is again the organisation (financial institution), similar to the case of handbook process development. In this case, financial institutions implicitly impose established hierarchies and the preferences of dominant power centres on technological decisions. That effect is visible through both the use of handbook processes as decision-control instruments and the implicit preference for opinions supported by higher-level executives or powerful expert groups as often indicated in interviews. (5.1, §40; 5.2, §30; 7.1, §67; 9.2, §51)

Finally, Expertise first reflects the specialisation and experience of Actors in their field that informs the decision activity with specialist knowledge. Because expertise also entails intellectual skills acquired during professional tasks, it necessarily reflects experience relevant to decision-making. As the Actor-based IGT framework suggests, expert Actors participate in decision-making by contributing their informed viewpoints to the implicit negotiation process that leads to the usable informed agreement constituting a decision. These viewpoints necessarily reflect experts' interest in legitimising their opinions, because that interest is embedded in their expertise in decision-making.

The following conclusions are drawn from this discussion: First, that because the actual purpose of the TIDM activity is an informed and usable agreement on the most suitable technological investment option, the use of both valuation techniques and handbook processes are external and ancillary to it. The agreement is mostly the outcome of negotiation and mutual adaptation of interests rather than the result of rigorous evaluations or precise executions of plans. Second, the hosting organisation conditions the TIDM activity implicitly through the representation of dominant official views about TIDM in the final decision processes. Third, expert Practitioners, who participate in the decision activity, contribute to the formation of decisions through supporting their perceptions of the TIDM problem and their professional and personal interests. They do so, not only to provide their specialised knowledge on the problem, but also to defend, legitimise and justify their proposed solutions.

Figure 8.4 shows the overall implementation of the POSE model on the three cognitive activities. The figure clearly demonstrates the distinctive purposes, outputs, roles of expertise and hosting structures (organisations) for each of them. The demarcation between the planes of Practitioners and Observers, as well as that between process and practice is also given a central role in the representation: Development of techniques is clearly characterised as a process that happens in the Observers space. In the same manner, both handbook process development and decision-making are placed in the Practitioners' space; however, they are distinguished by the process – practice demarcation discussed at the beginning of this chapter. Figure 8.4 also illustrates the relationships between the three cognitive activities as they arise from the above discussion and the analysis of empirical data.
that was made in chapter 7. The grey arrows linking the three activities demonstrate the relationship between them. Method Development, as performed in the Observers space, informs Process Development in the Practitioners space through use of methodologies, accepted by field experts. Such linkage comes in the guise of access to academic publications, past experiential use of methods in consultancy or other professional involvement. Similarly, Process Development informs Decision-making through its 'Output', namely applied handbook processes. These are used as measuring instruments or other input mechanisms to facilitate the ultimate decision.

Viewing the three activities through the POSE model helps, on the one hand, to connect them on the basis of their outputs and, on the other, to explain their different nature by underlining their disparate purposes and the roles of expertise that characterise each of them. That explanation will ultimately help elucidate the ambiguities expressed in the Anomaly of Practice.

Figure 8.4: The POSE model for establishing the relationship between the three cognitive activities.
Technological valuation techniques that Observers develop provide scientifically justified approaches for assessing the pecuniary or other value of new technologies. As the POSE model illustrates, valuation techniques are developed to accommodate effective assessment of technological investments. While that task is helpful in the context of Practitioners, 'effective assessment' is here defined in the terms of Observers' perceptions of the TIDM problem. 'Effectiveness' is mainly defined in the research-driven culture of Observers' organisations by the degree of rigour, level of detail and compliance with the principles of academic traditions underlying the technique development process. That stance is, in turn, driven by the mission of Observer organisations, and the ways by which experts within them operate to deliver valuation techniques. Most important, the development of valuation techniques, as it happens, has a mere advisory role with respect to the actual technological decision practice.

That situation contrasts with the handbook process development in Practitioner organisations. Whereas valuation techniques are indeed practically useful as benchmarking instruments, the core of handbook processes for TIDM lies in their role in controlling the stages of technological decisions, not only with a view to tracking erroneous actions but also to ensuring that the appropriate hierarchical levels sign-off the progress of decisions. In that setting, valuation techniques are peripheral: handbook processes do include them, but their design implicitly imposes the preferences (and thus perceptions) of powerful experts residing in the relevant hierarchical levels. On that account, expert-Practitioner knowledge of valuation techniques informs handbook processes through experts' familiarity with the Observers' space via their educational background, access to academic or trade publication or consultancy.

Finally, the activity of TIDM, as reviewed through the POSE model, necessarily makes use of handbook processes (and the valuation techniques embedded in them) because these are used to prescribe the desired process of decision-making. In that sense, handbook processes work more as a restrictive framework of operation during decision-making, rather than a guideline for delivering effective results. The reality of TIDM is the outcome of Actors' perceptions of what TIDM is and how it should be made. Decision stages, as prescribed by handbook processes, are necessarily adhered to, in order to ensure compliance with formal rules. However, the purpose of the cognitive activity of decision-making is the delivery of a usable informed agreement on technological choice. This is totally different from the one of controlling TIDM progress that handbook processes serve.

The Anomaly of Practice

The preceding analysis provides a frame for understanding the three cognitive activities that can be used to elucidate some of the ambiguities that the Anomaly of Practice introduces. This is because these ambiguities effectively relate to the ways that the transition
between valuation techniques, handbook processes and decision-making happens in reality. In contrast with received wisdom which proposes that the three activities are linked through a linear causal relationship, it has been argued throughout this thesis that they are connected in a seemingly anarchic way.

A number of issues arise from the Anomaly. First, given the wealth of scientific techniques that can be theoretically used to facilitate practical TIDM, very few of the basic ones are used by financial institutions. That appears even more paradoxical, if one takes account of the extensive financial expertise found in the banking industry. Second, the ubiquitous handbook processes involve only limited assessment of technologies on the basis of valuation techniques. Contrary to received wisdom that handbook processes are used to achieve objective assessment of technologies, their revealed role is that of control. Third, again contrary to received wisdom, decision practice is not the outcome of faithful application of handbook processes and valuation techniques. A project favoured by numbers is not necessarily favoured by decision centres. Neither, according to interview data, does a technological decision follow handbook process: decisions begin to take shape well ahead of processes, through preferences by influential individuals or the pronounced interest of powerful expert groups. Finally, given the observation that handbook processes are not faithfully followed, we can assume that success is the outcome of a yet-unexplained factor that should be incorporated anew into the handbook processes or valuation techniques. There is no empirical evidence, however, that this ever happens.

In the light of the analysis in the previous section, the fact that very few valuation techniques cross the borders of the Observer space to become established as practical tools is explained by the conflicting natures of technique development and handbook process development: techniques are outputs of research agendas and the publication strategies of Universities, government bodies and their expert Actors. They can also be the outputs of consultancy firms' development of reusable, commercially exploitable, methodologies. They are informed by the specialisation of experts in the task of developing methods rather than making practical decisions. On the contrary, developing handbook processes for TIDM in organisations has the purpose of controlling TIDM activity and, as such, limits the use of rigorous detailed valuation to minimal levels: use of complex valuation is seen as unnecessary because assessment precision in reality only influences decisions marginally. Furthermore, unlike Observers, Practitioner expertise is focused on dealing with practical issues rather than on optimising measures. For the same reason, working knowledge of complex valuation techniques is limited in the Practitioners' space (1.2, §44). Ultimately, as illustrated in Figure 8.4, the linkage between technique development and handbook process development is merely an informational one: Practitioners have access to the Observers' space through literature or consultancy outputs and their often common educational
background. However, the practical significance of valuation methods in the Practitioners’ space is minimal, regardless of their complexity or rigour.

With regard to the unconventional relationship between handbook processes and actual decision-making practice, the POSE model suggests that the disparate aims of process and practice in the Practitioners’ space are cardinal to explaining it. Handbook processes are developed by expert Practitioners with the purpose of controlling the progress of TIDM. The formal structure of the organisation conditions their development by assigning pertinent roles in the handbook processes to those individuals or groups that are established as those whose agreement is necessary for TIDM to happen effectively. On the contrary, the cognitive activity of decision-making is of a totally different nature: because its purpose is the achievement of a negotiated usable, informed agreement, handbook processes in decision-making have a restrictive role as to decision outcomes: because decision-making is a complex cognitive activity, the desired agreement cannot possibly be accommodated by any handbook process, however detailed or rigorous that might be. At the same time, handbook processes reflect a set of generic rules that Practitioners have to follow to ensure that they are not held responsible for any mishaps. These statements suggest that one way by which Practitioners as decision-makers seek the desired agreement on technological investments, is by driving the implementation of handbook processes (and the valuation techniques they embed) by favoured decisions, rather than the other way around. Instead of blindly using established processes as a standard input–output configuration, Practitioners implicitly use their perceptions of the TIDM problem and their underlying expert interests as the basis of their decision-making and, from there, adjust the inputs to the TIDM handbook process as they see fit for accommodating their perceptions and getting their subjective assessment through procedural formalities. In that scenario, handbook processes are used in decision-making activity as resources to promote preferred technology choices. That does not only explain the unconventional (backward) use of handbook approaches, but also the equally irregular use of valuation methodologies, as discussed previously in this chapter.

The ultimate issue arising from the Anomaly of Practice is the observed lack of processes or practical ways for translating successful TIDM outcomes into handbook processes or improved valuation methodologies. The fact that TIDM success is not explicitly translated back to techniques or prescribed processes can be explained through the POSE model, by taking account of their unconventional use in formulating decisions: because handbook processes are not used as the input-output models that they are supposed to be, it is unclear which of the factors prescribed in these processes are indeed used in practice. Assumptions and inputs to these processes are implicitly adjusted to fit the desired agreement on TIDM and, as a result, no substantial justifiable improvement can be introduced to the handbook process itself. Additional reasons for that have been occasionally revealed in interviews (10.1, §50) where post-implementation reviews (PIRs) were reportedly used only to identify erroneous actions in cases of failure; evidence for use of such
processes as learning devices was not provided, because firms largely viewed spending resources for that activity as an unnecessary luxury (1.2, §46). Finally, perhaps the most important implicit factor causing the lack of process improvement through identifying best-practice is uncertainty. It is due to uncertainty that the process of technological implementation takes a long time to deliver benefits, which makes linking its achievement back to the decision process very hard due to time distance and the presence of new parameters that were invisible before implementation began.

The effects of uncertainty of TIDM are embedded in Practitioners' perceptions of the problem. That was occasionally phrased by interviewees who saw the use of sophisticated financial or other valuation techniques as unnecessary due to the absence of concrete knowledge about the assumptions that should be used. Similarly, it appears that it is due to the same implicit understanding of uncertainty that, when making decisions, managers revert to 'satisficing' behaviour, giving little attention to detailed value assessments and more attention to achieving a usable informed agreement on technological choices that can be defended. Ultimately, the knowledge of the existence of uncertainty in technological implementation leads managers not only to attribute minor importance to improving handbook processes, but also to often leverage the firm's lack of knowledge about the future to tweak the inputs to handbook processes so as to fit their preferred technological choice.

Conclusions: Towards Explanatory Frameworks

This chapter addressed the disparities between processes, established in the Observers and Practitioners spaces to deal with TIDM, on the one hand, and the practice of decision-making on the other. It began by identifying a set of seemingly irrational occurrences that were observed through empirical investigation, and which were conceptualised under the term Anomaly of Practice. To deal with this anomaly, the theoretical and practical antecedents of the process-practice dichotomy were discussed, and it was advocated that previous key theoretical attempts to deal with decision-making - Organisational Studies and New Institutional Economics - did not focus on the relation between assessment processes and decision practice, primarily because they perceived valuation as external to their field of interest. The discussion then focused on investment valuation theories where the different nature of the valuation process and decision-making practice was again demonstrated. The discussion concluded that existing theories and research strands have not explicitly provided explanations for the Anomaly of Practice. The POSE model was then introduced and implemented to analyse the anomaly and provide a coherent explanation. The POSE model addressed the Anomaly of Practice in three ways:
1. Addressing technological investment valuation methodologies through the four dimensions (purpose, output, structure, expertise) provides a systematic explanation of the observed unintended misuse of techniques in the industry: it explains how methodologies assume different roles when in different social contexts and when owned by experts of different perceptions.

2. By revealing the incompatibility of purposes, interests and perceptions of experts between Observer and Practitioner space, the model provides insights as to why the numerous TIDM methodologies proposed in the literature do not find their way into practice. That observation contributes to partly answering the question of why practitioners insist on relying on traditional appraisal techniques, despite their pronounced inadequacy to facilitate TIDM as evaluation aids.

3. By contrasting the disparate POSE composition that characterises TIDM approaches in Observer and Practitioner space, the model hints at possible reasons for the absence of successful systematic recording of best practice and its embodiment into improved TIDM methodologies.

It is suggested that looking at the Anomaly of Practice through the POSE model allows for a systematic account of the disparity between TIDM technique developments in the Observers' world, as against that in the Practitioner space. By locating the sources of that disparity, the model underlines the role of the perceptions of experts and offers a conceptual framework for understanding how these perceptions are shaped by the professional roles they assume in their organisation. It is furthermore argued that the use of any technological investment appraisal technique is socially constructed within the user-firm to suit purposes that are different in Observer and Practitioner spaces.

Further, empirical evidence suggests that the process of technological implementation that follows TIDM appears to bear little relation to TIDM and its outcomes. That discontinuity between the use of decision instruments and the practical application of decision outcomes was underlined in Chapter 7 as one of the key findings: that unlike successful implementation, in-firm reviewing processes are not used as a learning device, but merely as a reporting instrument for identifying failure and for ensuring accountability to those responsible for it. While the dominant interpretation of this is that the firm cannot afford to devote resources to the task, its sources can also be found in the structures of assessment and reporting that reside in financial institutions and their different nature compared to their equivalents in the Observers' space. The POSE model offers explanations for this: In the Observer space, the development of a technique is the ultimate aim of the organisation and, therefore, testing and improvement through experiments are necessary parts of the process. On the contrary, in the Practitioner world, the aim of the organisation is the gainful use of the technique to deliver reliable results and, consequently, no 'natural
position' exists for establishing appropriate structures for improvement of processes and learning.

As a final comment, the treatment of decision-making by Organisational Theories in the past half-century has concentrated on either developing theoretical approaches to explain the fullness of organisational activity, or delivering systematic algorithms to describe and control the mechanics of processes in the organisation at the micro-level. In these attempts, the roles of power, interests, expertise and institutional structures have been widely researched (see Fincham et al., 1994 for an example); however, apart from few instances the resulting models have done little to incorporate the influence of perception about the reality of investment decision-making and investigate the process – practice dichotomy in its fullness. That is the task which will be carried out in Chapter 9.
Chapter 9: Practitioners, Observers and the Community of Received Wisdom: Identifying the Structure of TIDM Reality

Introduction

The three previous chapters provided a complete picture of the theoretical views and empirical evidence surrounding the problem of TIDM in UK Internet Banking projects. These chapters explored the reasons for the disparity between prescribed TIDM processes and actual decision-making practice. The perceptions of expert groups and their understanding of technological value were identified as the factor determining TIDM reality, through a process where prescribed processes are filtered through these perceptions to deliver TIDM. It was furthermore observed that the rigour of investment appraisal techniques played a minimal role in actual decision-making, and was more central to justification than assessment. Dominant positions of expert groups were found to be pertinent in TIDM. With regard to the decision-making processes, the degree of rigour in technological investment valuation appeared to depend largely on the prevailing economic cycle and the degree of power that the traditional Finance and Accounting functions had in the firm. Hierarchical structures were also found to play an important role in how technological decisions were taken, due to the fact that established hierarchies promoted standardised viewpoints at the higher decision levels, reflecting the existence of strong power centres based on expertise. The disparity between technique development, prescribed process and decision-making expressed through the Anomaly of Practice, was then explained through the POSE analytical framework.

In the present chapter, TIDM is reviewed through the wider Actor-based IGT approach proposed in Chapter 2. The chapter discusses the three categories of Actors -
Practitioners, Observers and the Community of Received Wisdom – and provides a complete conceptual model of the Actor-based IGT approach. This model explains the relationships between research approaches, handbook-prescribed processes and established practice for TIDM by suggesting that the reality of TIDM is the outcome of interactions, negotiations and mutual adaptations between viewpoints of Actors. This further suggests that the established normative quantitative assessment paradigm (addressed in Chapter 6) and the attempt to enhance TIDM through ‘improvable measurement’ is failing to achieve better understanding of the value of technology. Each method subscribing to improvable measurement practically ignores the existence of alternative approaches and their contribution in defining the measured entities and thus in defining value. Contrary to that, it is proposed that this understanding can only be reached outside the disciplinary or other perceptual boundaries, by recognising that each perception is only partial and that the problem of TIDM is constructed by these perceptions. This is a dynamic social process where Practitioners, Observers and the Community of Received Wisdom interact by using their scientific or professional legitimacy, their power positions, persuasion skills and influence to promote expert opinions and interests. It is in the light of that dynamic process that this chapter proposes the conceptual framework for addressing TIDM.

A re-examination on the Actor-based IGT Approach

The following section will re-examine the Actor-based IGT approach in the context of empirical findings, and explain how the conclusions drawn in the previous chapters are brought together under this one conceptual model.

The section will: briefly recapitulate why none of the established approaches, particularly those coming from Organisational Theory\(^1\), can suitably accommodate the approach used in this work; explain how the framework is implemented to contextualise the findings of this research; and illustrate how the Anomaly of Practice and the modes of implementation of TIDM techniques are accommodated in the Actor-based IGT. These three goals are addressed in turn.

The rationale of this research lies in the observed inconsistency between prescribed processes for Investment Appraisal and TIDM, on the one hand, and actual practice of technological decision-making, on the other. As discussed in Chapter 8, the wider problem of inconsistency in investment appraisal has only been addressed at the level of financial valuation (Pike, 1996; Payne et al, 1999; Graham & Harvey, 2001; Brounen et al, 2004), and viewed not as a problem on its own right but rather as an inquiry into the extent of usage of

\(^{1}\) Particular attention is paid to Organisational Theories because, to date, they represent the only cross-disciplinary attempts to explain behaviour in organisations through contributions from Sociology, Economics, Psychology and Cognitive Science.
methods. That type of inquiry does not address organisational reasoning as a source; neither does it try to explain the mechanisms through which such inconsistency occurs. Furthermore, it does not explicitly address technological investment, but rather retains the established perception within the Finance discipline that technology should be treated as infrastructure.

Organisational Theories also do not treat the process – practice dichotomy in TIDM as a problem: They look at TIDM and the role of Investment Appraisal as something belonging to the Finance & Accounting disciplines. Furthermore, Organisational Theories implicitly see the process-practice dichotomy either as an inefficiency of organisational functionality that needs to be corrected, or as a given regularity that is explained by lack of information, complexity or lack of resources to implement in the industry. Moreover, no attempt is made, within Organisational Theories, to derive explanations based on perceptions (although perceptions are addressed as a peripheral component in Organisational Theories). Existing approaches underplay the role of different understandings of the value of technology as well as the role of disparate perceptions between expert groups with distinct educational backgrounds.

The Actor-based IGT approach begins by observing empirical data (interviews and documentary evidence) and, from there, constructing a theory to make sense of the findings; it uses Informed Grounded Theory which recognises that past theory informs the opinions of interviewees. Because it draws on experts of different backgrounds, it is able to investigate the role of these backgrounds in shaping perceptions. At the same time, it accepts that these perceptions are conditioned by the organisation that experts populate. By relying on empirical evidence, the Actor-based IGT overcomes the disciplinary boundaries of academic research strands; it does that by disengaging from these strands by explicitly recognising that each one offers explanations of the TIDM problem within their disciplinary boundaries. The overall model, as proposed in Chapter 2, is reconstructed in Figure 9.1.

Figure 9.1 illustrates the interlinked roles of different Actors and Actor classes, and proposes that the reality of TIDM is socially constructed as opposed to being addressed externally by experts. That reality is the outcome of interactions between different types of interested parties (Practitioners and Observers). These interactions happen within a socio-economic space that is dynamically defined by its constituents (the Community of Received Wisdom). To further comprehend how perceptions about TIDM are formed within each Actor class, it is useful to review the worlds of Practitioners and Observers in light of the professional spaces they entail and the expertise that informs Actors’ backgrounds within the two distinct settings.
First, each professional space is characterised by a mode of thinking that is distinct across Actor classes. That common intellectual infrastructure allocates the different identities to Observers and Practitioners and is defined by the goals of the organisations that employ them. In the case of Observers, Universities, governmental organisations and consultancy firms treat TIDM techniques as an output and their aim is the development (rather than outright use) of techniques or instruments for assessing technologies\(^2\). To them, TIDM techniques are deliverables, more than they are facilitators. On the other hand, for Practitioners the intellectual infrastructure is defined by a common understanding that TIDM methodologies aim to assist the efficient allocation of the firm's resources. Practitioners' view

\(^2\) This is not to suggest that assessment tools developed in the Observers' world are not used instrumentally, but rather that these are not used in making decisions. Assessment has a different role for academic and industry researchers or consultants than it does for managers.
of TIDM is largely conditioned by the fact that the goal of the firm is to deliver shareholder wealth and, in that process, use TIDM techniques as facilitators.

Second, perceptions on TIDM are invariably influenced by experts' educational background and training. At that level, it is important to concentrate on how expert groups operate in each Actor class. Practitioner experts assume a different role than Observer experts do, primarily because of their different job specifications and, consequently, the ways they make use of their knowledge. Available knowledge taxonomies provide useful insights into explaining that particularity (Polanyi, 1966; Nonaka and Takeuchi, 1994; Steyn, 2002). For instance, Nonaka and Takeuchi (1995) offer a model for analysing the development of expertise through the tacit-explicit knowledge combination.

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<tr>
<th>Tacit to Tacit</th>
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<tr>
<td>SOCIALISATION</td>
<td>EXTERNALISATION</td>
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<tr>
<td>e.g. team meetings and discussions</td>
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<th>Explicit to Tacit</th>
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<tr>
<td>INTERNALISATION</td>
<td>COMBINATION</td>
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<td>e.g. learn from a report</td>
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**Figure 9.2: Conversion of knowledge between tacit and explicit forms (adapted from Marwick, 2001)**

This can be used to explain in what terms such interaction is different between Practitioner and Observer organisations. In Observer organisations (e.g. Universities) interaction, group meetings, reports, or other forms of formal or informal communication takes place in the institutional setting which is driven by a research agenda. Similarly, in a government body, interactions between researchers are yet again generated in a similar setting with the one of Universities, the agenda being that of evaluating and producing results for addressing the wider societal, strategic and economic value of technology. It involves decision-making of a different type, namely the decision as to whether a technology or class of technologies is usable, in need of government subsidisation or in need of control. Consultants, in turn, are not assigned with the task of making a decision but offering a solution. They act as problem-solvers often under an outsourcing model, but they are not
accountable employees of the firm. Their expertise is developed through a particular tacit-explicit relationship that is both industry-related and academia-related but more generic than the one of Practitioners. Their organisations have the purpose, not of solving their clients’ problems per se, but to generate income from solving these problems. Whenever that process involves the development of methodologies, these are created as reusable instruments for assessment; the dynamics of decision-making that permeates the world of Practitioners is not present.

At a different level, the development of expertise in the Practitioners space is more appropriately described through the notion of the ‘reflective practitioner’ (Schon, 1983): practitioners make decisions on the basis of their previous knowledge and experience and through testing various possible solutions. However, Schon supports that, in this way, practitioners implicitly reject what they have been taught during their professional training.

Figure 9.3: The formulation of TIDM reality by each expert group in the Practitioner space (adapted from Fig. 7.2).
On the contrary, the Actor-based IGT model suggests that the very perception of Practitioners on TIDM is conditioned by educational background and professional training. Within the Practitioner space, each expert group filters the TIDM problem through its own perceptual prism as indicated in figure 9.2 (a reproduction of Fig. 7.2). Ultimately, the view on TIDM that dominates in the firm is a result of interactions between these views. The outcome of such interactions is determined by common logic, power positions, influence and prestige of experts, as well as the context and idiosyncrasy of both the firm and the particular technology.

Similarly, the disparity of viewpoints in the Observers' space is more clearly visible, and made to be so, through academic disciplines, following the Political Organisation of Knowledge discussed in Chapter 2. That demonstrated that the viewpoints of each Observer - expert are driven by the academic discipline that informs his or her background. They are also conditioned by the demand to mobilise their expert knowledge for developing methodologies, acceptable in their professional space (academia, government or consultancy). Therefore, unlike Practitioners, different Observers view TIDM in dissimilar ways not only because of their different educational background and specialisation, but also because of their disparate organisational and individual aims. Observer experts too subscribe to an organisational goal, although that may be different from that of Practitioners. That organisational goal is most often scientific or other publication or the development of techniques as marketable outputs. As a result, the mechanism through which TIDM reality is formulated by each Observer expert group is similar to the one applying to Practitioners, as illustrated in Figure 9.4.

This model shows how Observer – experts' perceptions of their organisation's research agenda and established research processes operate to deliver TIDM reality. Notably, the TIDM problem in the Observers' space takes the shape of techniques for assessing technological investments or recommended solutions (as it often happens in the case of consultants). Valuation techniques - the output of experts' activity - are again socially constructed by researchers-experts' particular educational background, as is the case with Practitioners. Not uncommonly, academic researchers of different backgrounds address technological investment valuation in different mindsets, even when they populate the same academic discipline or research strand.

An important distinction should be made between expert perceptions in the Observers' vs. the Practitioners' spaces. Perception in the Observers' world (academia, in particular) is typically embedded within the rigorous frameworks of academic disciplines, leaving researchers with little freedom to interpret. Furthermore, the problem of TIDM as viewed from the Observers' point is not the pressing issue in need of immediate practical solution that it is for Practitioners; Observers' role is advisory. To them, TIDM is a field of study, policy or commercial exploitation. In these respects, the perceptual boundaries of
Observers are naturally more limited to interpreting rules and accurately following research processes than making decisions. The judgemental, evaluative and critical skills of experts are more apparent in the Practitioners space.

**Figure 9.4: The formulation of TIDM reality by each expert group in the Observer space:** Observers are ‘practitioners’ in organisations of the Observer space (Universities, Government bodies, Consultancies). Their perceptions on TIDM operate as a filter of (1) the established research processes for addressing the TIDM problem and (2) the research agenda of their employing organisations.

The third class of Actors was illustrated in Figure 9.1 as the wider circle that contains Practitioners and Observers. That was termed in Chapter 2 ‘the Community of Received Wisdom’ (CORW) to illustrate a broad enterprise that encapsulates the common mind and the unaware socio-economic groups that are indirectly linked with the TIDM problem. In formulating TIDM reality, that enterprise interacts with Practitioners and Observers through a process of mutual influence: On the one hand, the view of the CORW about the value of technology and TIDM is grounded in expert views, of both Practitioners and Observers, whose opinions are reflected in the financial press and other specialised trade publications. On the other hand, because the CORW reflects a common understanding of TIDM that is
already established in the socio-economic space, Practitioner and Observer experts register their perceptions about TIDM with it. This is not only because they are members of that Community themselves, but also because they need to identify with the CORW in order to sustain the validity of their arguments as logical, coherent and widely acceptable. The relationship is therefore circular: The CORW draws on Practitioners and Observers to formulate its dominant views on TIDM, whilst also acting as the wider social space through which Practitioners and Observers legitimise and communicate their perceptions of technological value. The Actor-based IGT model suggests that the social construction of TIDM effectively happens within the CORW, where Practitioners and Observers negotiate their views on TIDM both with each other and with the CORW. That process is more thoroughly discussed later on in this chapter.

Figure 9.5: The framework explaining the Anomaly of Practice (adapted from chapter 8).

The third and final objective of this section is to demonstrate why the Anomaly of Practice should be addressed through the Actor-based IGT approach. The Anomaly was
discussed in Chapter 8, which showed that the process – practice dichotomy is best addressed by looking at TIDM methodologies, Handbook-Prescribed Processes and outcomes of TIDM as configurations of Process, Output, Structure and Expertise. It further explained that the arrangement of those four elements determines the shape of TIDM in the Practitioner and Observer spaces. The present discussion will explain how that approach fits in to the wider Actor-based IGT framework and how, in turn, that setting explains the Anomaly of Practice. The generic framework is reproduced in Figure 9.5.

Viewing the social construction of TIDM in UK banking as a process of interaction between the three identified Actor classes places the Anomaly in full context. A coherent explanation of the Anomaly makes sense only within the social constructionist view of TIDM. The Actor-based IGT identifies the social spaces within which approaches to TIDM are developed. These are research and commercial institutions (such as Universities, government bodies and consulting firms) in the case of Observers, and financial institutions in the case of Practitioners. Furthermore, by proposing that the views expressed by interviewees (Practitioners) are informed by the same educational background that informs Observers, it recognises the common roots of the expertise that resides in both spaces and underlines their key difference in the advice vs. decision-making roles that experts assume in the two spaces. That observation underlines the point that the difference between the thinking of Practitioners and Observers as regards TIDM is not merely that of ‘theory vs. practice’. Rather, it lies in the actual ways the TIDM methodologies ‘grow and live’ within the two spaces; it also lies in the perceptions of experts in each space about the problem. Disparities of perception about the TIDM problem exist precisely because of the different Actor status of each perceiver.

The remainder of this chapter will address the specifics of each of the three Actor classes. The discussion is presented in three sections. In the first, the role of Practitioners is examined, and it is proposed that the construction and sustenance of expertise around technology, valuation or other fields forms the primary mechanism for promoting particular viewpoints and stances to TIDM. Given the changing structures of traditional expertise centres, it is further contended that the background theoretical and practical training of Practitioners critically influences their stances. It is also contended that the prevailing treatments of TIDM in the firm are the outcome of negotiations between expert groups on the

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3 Other explanations of the Anomaly may be provided within the paradigm of improvable measurement, where it is broadly agreed that the reason for the Anomaly lies in the lack of methodologies detailed enough to accommodate the complexity of real-life technological investment decisions, and that the process-practice disparity therefore results from measurement inefficiency. For instance such is the stance of many attempts in the literature to explain the IT Productivity Paradox (Dievert and Fox, 1999; Willcocks and Lester, 1996). That rationale is contrary to the one adopted in this work, in which the usage and usability of TIDM techniques depends on social context and resident perceptions.
basis of their power positions, their ability to use scientific legitimacy to promote their views and the consistency of these views with those of the Community of Received Wisdom.

The second section deals with Observers, and examines the structure and mode of development of their expertises. It contends that it is the particular basis of research professional activity that delivers their stances to TIDM, which are in distinct contrast with those of Practitioners. In examining that group, the chapter looks at the particular role of objectivity and the process of scientific legitimation of TIDM approaches, mostly through academic publication. The authority of scientific, policy or market knowledge is examined in its role as an instrument for that legitimation in Observer organisations. Ultimately, it is explained how the TIDM approaches proposed by different Observers result from subjective judgements dictated by academic disciplines and research agendas.

The third and final Actor category is introduced in the model to represent Actors who fall in neither of the other categories and who represent the unaware social group that expresses the common dominant understanding of what technology is and how it should be appraised. In that discussion, it is proposed that the Community of Received Wisdom plays the role of a cohesive material that brings interested Actors together in constructing TIDM reality.

The Practitioners' Approach: Perceptions, Expertise and the role of Educational Background

The analytical discussion of the Actor-based IGT model begins with Practitioners. The roles and stances of Practitioners in TIDM have largely been addressed in Chapter 7, where practical approaches were discussed in light of interview evidence. That chapter concluded that TIDM is understood and tackled in the firm through a mechanism where expert group perceptions are informed by (a) the 'handbook-prescribed processes', derived as mechanisms for controlling decisions and (b) the 'established decision structure' dictated by organisational culture. It is proposed that each expert group operates within that setting (described in Fig. 9.3) to approach TIDM and provide workable solutions for technological investments.

As explained earlier, that approach is contrary to the view that the TIDM problem precedes Actors, who then come as external influencers to offer their explanations, perceptions and opinions and ultimately impose them through negotiation or exercise of
power. That assumption is considered unsatisfactory because it does not explain how the problem of TIDM evolves within the intellectual setting of the organisation. Rather, it sees the problematic of technological decisions as either a natural consequence of the complexities of technology and the organisation, or as an anomaly of the ‘normal’ decision-making function. In doing that, it implicitly defines the TIDM problem in normative terms and only with reference to the organisation as entity. It furthermore fails to take account of the roles of expert practitioners, as self-interested individuals and, at the same time, members of professional collectives: conventional wisdom gives Actors merely an interfering role, where the expert is used by the organisation as a professional problem-solver, whose individual and collective interests come into play as soon as he or she is called-in to deal with the problem. That assumption fails to accommodate the defining role that Actors assume when addressing the TIDM problem.

Contrary to that established view, the Actor-based IGT approach looks at Practitioners as those who play a role in defining (as opposed to simply addressing) the shape of TIDM by focusing on the facets that their expert field deals with and using their expert knowledge to describe and legitimise it. These expertise areas are addressed below. It is stressed again that the categories of Practitioners identified in this work do not by any means constitute an exhaustive list. They merely are a set of broad specialisations identified in the empirical work.

**The Perception of Finance Practitioners**

The empirical evidence suggests that Finance experts in UK banks maintain not only a quantitative viewpoint to technological investments, but also a mindset that is focused on risk-return relations and key concepts of the Finance discipline. That is the implicit perception they subscribe to, not only as Finance graduates, but also as members of professional communities. That subjective perception is informed by the core interest of Finance expertise to address the aspects of TIDM that relate to economic costs and benefits and performance assessment. It is reinforced by the practical value of quantitative economic measurement for benchmarking and comparison, with the result that the Finance Practitioners' perception of the TIDM problem fits, by definition, the traditional organisational need for monitoring performance.

It is necessary to underline here the role of Finance Practitioners in defining – rather than addressing - TIDM reality in the bank: the very problem of deciding among candidate technologies for a particular organisational task is assigned, by default, to experts who are thought to hold an established status as owners of relevant formal knowledge. Because of

4 That is the conventional positivist attitude where experts are taken to be external to the problem as it appears in the firm, and are seen merely solvers for problems that predate their involvement.
their status as specialists, Finance experts decide, and ultimately define, how the problem should be conceptualised and expressed in terms understandable within their own sphere of experience and expertise.

**The Perception of Accounting Practitioners**

Similar to Finance, because Accounting is one of the prevalent expertise strands from which managers traditionally move up the executive ladder in the banking world, perceptions of Accounting professionals are bound to have higher status among Board members. That makes them of key importance to the overall social construction of TIDM.

Accounting specialists deal with the native outcomes of TIDM as these are disclosed in financial statements. In that respect, their perceived side of the problem relates to how each technological option is reported in figures; rather than focusing on the business side of technological implementation, the Accounting viewpoint is informed by the necessity to appraise different technological options on the basis of recording costs and benefits in a manner consistent with regulations. Similarly, because financial reporting is the primary means of disclosing financial information to investors, Accounting professionals carry-out a dual task: representing financial data on technological investments in a way that best reflects the economic health of the firm, while evaluating candidate technologies on the basis of their suitability to conform to that representation.

Important connotations arise from the role of Accounting as means of disclosure and appraisal. These regard the use of Financial Statements as information conveyors, and the use of figures and ratios reflected in these statements as indications for evaluating investments. With regard to the first connotation, performing the Accounting task is necessary for conveying the right information to shareholders. However, the reporting-driven perceptions of Accounting experts merely cover one of the many facets of TIDM. In that way, the TIDM reality constructed by Accounting professionals is one where the problem of value of new technology translates into selecting and implementing technological solutions whose benefits and costs are most suitably communicated to shareholders as beneficial to the bank. That is not to suggest that this is the only or even the primary criterion that Accountants use to appraise a particular technology. It is only reflecting a particular mindset for measuring technological value through accounting figures. That brings us to the second connotation, namely that of using ratios - standardised in Financial Statements - as the main guidelines for appraisal. While the typology of Accounting figures reflects key performance indicators whose importance is recognised industry-wide, this does not mean that these indicators are capable of providing a full picture of the economic and strategic value of any candidate technology. Indeed, using them as guidelines often entails the risk of over-relying
on their status of wide-acceptance, with the resultant misperception that technological value stems from the positive reactions of shareholders to healthy financial figures.

**The Perception of Banker Practitioners**

The term Banker Practitioners is used for those individuals who have either gone through University education on Banking and Finance, or through professional banking training and examinations, regardless of their previous educational background. Traditionally, Banking expertise goes hand-in-hand with the quantitative training of Finance and Accounting. The empirical evidence of this work indicated that, apart from the quantitative mindset that permeates Banking expertise, bankers' attitudes to TIDM is mostly conditioned by the professional tasks that come with their organic roles. Because Banking experts fill all types of job descriptions across the bank, bankers' understanding of the TIDM problem is less uniform than that of, say, accountants or finance practitioners. However, there is a common denominator that informs their overall stance to technological value and the criteria of investment decision making. That common denominator is the theoretical viewpoint of the Banking discipline that defines the financial institutions' tasks to be (1) deposit-taking and loan provision, (2) payment settling and clearing, (3) pooling and transferring resources and (4) managing risk (Crane et al, 1995: pp. 14-16; Kidwell et al, 1997; Saunders, 2000).

TIDM is seen by banker practitioners in light of that common viewpoint. Their focus is on how technological investment will benefit the performance of those four key tasks. Technological efficiency is addressed by banker practitioners through a set of Key Performance Indicators that are different from the traditional financial and accounting ratios and benchmarks. These performance indicators often refer to man-hours, Full-Time Equivalents (or FTEs), computing capacity or processing power and other measures that make sense of the pragmatic influence of the implemented technology on different structures in the organisation (Steiner and Teixeira, 1990). Their significance is of a quantitative nature, but in a manner dissimilar to the ratios used in Finance and Accounting for quantitative analysis. Instead of looking to use the universal measures of Finance and Accounting to manage risk and to ensure consistency of the bank's operations with the reported figures, they are geared to assessing the business performance of the bank internally and directly. In that respect, the expertise of Banker Practitioners is crucially based more on field practice than on academic knowledge.

That practice-based character of Banker expertise allows for a higher level of adaptability to changing conditions in the banking industry. A clear indication of that can be observed if we consider the alterations in the nature of Banker expertise with technology, across the different eras addressed in Chapter 4. It is, I propose, the flexible nature of
practice-based specialisations (such as Banking and, as suggested in the following paragraph, Marketing) that gives these expertises a leading role in periods of transition, such as that of the post dot-com boom era in banking.

**The Perception of Marketing Practitioners**

In a similar manner to Banker Practitioners, Marketing experts populate positions all across the financial institutions. This is because their specialisation is, more often than not, unconnected to their educational background or field of past academic study. Marketing executives come from all educational backgrounds, with few of them reported to have undertaken Marketing studies. Instead, their professional roles as Marketers evolved through developing expert field knowledge of the market and through experience in positions relevant to any of the already mentioned specialities.

Marketing experts' perception of the TIDM problem appears to be conditioned by their understanding of technological value with reference to the customer's experience of service quality. As such, Marketing experts consider TIDM from the perspectives of delivering value to the customer and driving customer behaviour. They view the assessment of new technologies as an attempt to measure the benefits to the bank which arise from the technology's impact on customers. In that respect, the Marketing view of technological investment is dictated by the experience-driven and practice-based nature of the marketers' job. In these terms, the Marketing Practitioners' expertise can be seen as a speciality that, on the one hand, rests on the individuals' diverse educational backgrounds while, on the other, is built on the practical understanding of customer needs in the banking business area. Similar to Banker experts, the diverse educational and professional background of Marketing practitioners gives them a distinctive flexibility, allowing their expertise to evolve through different transition periods. That is verified by the opinions of interviewed practitioners themselves, who most often identified the future of banking expertise to lie with a hybrid Banker-Marketer class of experts. (1.5, §57; 2.2, §62; 5.1, §55; 6.1, §76)

**The Perception of IS/IT Practitioners**

Information Systems expertise has been around in UK banks since the late 1980s (Fincham et al, 1994). Because of the recognised pertinence of IT infrastructure for the bank's operation and its significantly upgraded role in the global financial system, IT expertise since then has permeated all aspects of financial institution management and, thus, assumed a strategic role. IS/IT practitioners most often share an educational background of Computer Science and Electronic or Systems Engineering. Their professional
roles, however, extend from purely technical computer-code development to design and administration of strategic information systems.

The professional training of IS/IT practitioners is highly technical and their involvement in technological implementation is direct. Their understanding of the value of technology for the firm is conditioned by that type of direct exposure to the problem. This happens, notably in two ways:

(1) As professionals, they are primarily concerned with the design and development of IT systems and the information these are built to manage. Because they perform their technical tasks through standardised engineering methodologies of design and assessment, their mindset is geared to what these methods propose as measurement techniques. Furthermore, their understanding of the economic side of technological implementation is often constrained by the piecemeal analytical approaches that their technical methodologies propose.

(2) As managers, on the other hand, IS/IT practitioners are exposed to the strategic value of IT systems that is hard to justify on the grounds of hard numbers prospectively, mainly because of their underlying uncertainty as regards both the cost structure and the degree to which the technology will work as intended.

It is this technology-centric perception of IS/IT practitioners that prescribes how they construct TIDM reality: in assessing technology, their understanding and interest is distinct from that of Finance and Accounting practitioners in that they are not concerned with shareholder impact or profit-loss reporting, but with systems efficiency, improvement of technical performance and integration. More importantly, their long-term direct involvement in the implementation process makes apparent to them that TIDM should be heavily driven by the strategic element, in addition to the established quantitative performance measurements.

The Perception of Legal Practitioners

Legal experts in the bank are a class of practitioners whose educational background bears the highest relevance to their occupational status as practitioners. Legal expert practitioners are primarily Law graduates, who specialise in Corporate and IPR Law; unlike expert groups such as Bankers or Marketers whose professional development is primarily

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5 The engineering approach to technological systems implementation is largely based on analytical-synthetic concepts where the cost-benefit structure is broken down on the basis of technical elements (hardware, software or other infrastructure)
industry-based, Legal practitioners in banks are characterised by an expertise-based quality as Law-practicing professionals.

As explained in Chapter 7, the approaches taken by Legal professionals to the TIDM problem were not disclosed directly through interviews. They were, instead, reflected by other practitioners when dealing with the importance of regulatory compliance and the role of legal technicalities in TIDM and the costs of implementation. In that respect, the interest of Legal experts is reportedly geared to assessing candidate technologies as to: their suitability to conform to FSA regulatory requirements (such as capital ratios or systems performance) or satisfy internal benchmarks used to measure data integrity and systems security; the ability of the bank to establish and carry out third-party contracts for technical development without malign impacts on the bank's IPR; and the potential exposure of the institution to threats relevant to branding, IPR and the general public image.

The Observers' Approach: The Objectification of Subjective Judgments

The second class of Actors to be discussed is that of Observers. Observers are commonly identified as expert professionals who are concerned with TIDM in order to either develop methodologies that can be used to assess the value of technology from different perspectives, or deliver workable solutions to specific practical technological problems. In these roles, Observers approach TIDM as advisors, in contrast to Practitioners who act as accountable decision-makers. Three classes of Observers have been identified as relevant to this work: academic researchers, government bodies and consultants. It is noted that this is not an exhaustive categorisation; it rather provides an adequate account for the purposes of this discussion. As it was explained earlier in this work, that categorisation is based on three respective motives for involvement with the problem: the promotion and dissemination of scientific knowledge; improved understanding for public policy and regulation; and commercial exploitation.

Largely, formalisation of Observers' perceptions of the problem of TIDM and technological valuation is made through the Research Approaches discussed in Chapter 6. It should be noted that the approaches of government bodies and consultants were not discussed separately in that chapter. Instead, their stances were implicitly included in the Research Approaches because of the close connection between both public policy and commercial research with techniques developed in the academic field. The distinction made between academics, consultants and government Actors is made on the basis of the 'rules of engagement' that each category has in developing TIDM methodologies and recommending
solutions to specified problems. That distinction is explained, again, through the POSE model that is used to demarcate the differences in TIDM method development under each of the categories of Observers.

In the Observers' space, the cognitive process of developing TIDM techniques is similar to the one for interpreting reality that was identified in the Practitioners' world. The social construction of outcomes in the Observers' space happens through accommodating experts' interests and perceptions rather than in spite of them, in the same way as it happens in the Practitioners' space. That similarity in structuring TIDM reality in the Observers' and Practitioners' spaces underlines that academic or policy researchers and consultants are themselves practitioners in the world of Observers: as professionals, they are subject to organisational rules as well, although these may be different from the ones prevailing in industry. Notably, the difference between the two spaces is mainly concentrated on the disparity between the advisory role of Observers as against the decision-making role of Practitioners. The three types of Observers are briefly addressed in the following paragraphs.

Academic researchers largely assume their roles as TIDM Actors through their formal grouping in two levels: their employing organisations (Universities), and the academic disciplines they belong to. Academics' approaches to TIDM are conditioned by requirements imposed by their employing institutions regarding the publication of research and the dissemination of knowledge (Gaston, 1978). It is also dictated by the research agenda of their University, which usually promotes specific types or areas of research through funding incentives. On the other hand, academic researchers' roles as members of the scientific community are conditioned by the demand for them to adhere to, support and promote the positions of the discipline they subscribe to. That is directly relevant to their individual interests as University employees: academic recognition and achievement of higher professional status is conventionally reached through peer-reviewed publication that is, in turn, driven by the legitimation of research outputs by the scientific community. The overall relationship between academics and their communities is largely dictated by the established reward structures of science, as addressed by Merton (1973) and Giere (1988).

The second Observer category to be discussed here is that of government-employed researchers. Typically, their relationship with academic research is direct: individuals involved in government policy and research are, most often, either contracted from the academic community through research grants, or employed as professionals of high

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6 The correspondence between the two models (represented in Figures 9.3 and 9.4) is explained here: The actual outcome (method development for Observers, decision-making for Practitioners) is delivered through the application of expert viewpoints (expert interests and experience for Observers and expert perceptions for Practitioners) on prescribed processes (research process for Observers and handbook-prescribed process for Practitioners) within organisational settings defined by established structures (research agendas for Observers and established decision structures for Practitioners).
academic tenure. That strong relationship is historically demonstrated by the deep involvement of government in science and technology, especially in the United States and the UK with the development of Technology Policy and Technology Assessment fields in the 1960s and 1970s (Morgall, 1991; Coates (2001); La Porte, 2005). Government bodies as Observers to the TIDM problem are concerned with the development of public policy and thus look at the TIDM problem with regard to the broader social impacts that technology selection may have. It should be noted that TIDM for Internet Banking is of little, if any, importance to government technology policies, because TIDM activity has an explicitly different meaning in government policy than in industry. Assessment in the former case is made largely with reference to identifying technologies’ impacts and importance for wider society, whereas in the latter, assessment is focused on comparing and making definite ‘yes or no’ decisions among candidate projects. However, the frameworks and methodologies for evaluating and assessing new technologies that inform TIDM do carry significance as potential tools for Technology Assessment and, subsequently, technology policy development. Government bodies therefore assume a role as Observers through expressing indirect interest to TIDM by participating in the development of technological valuation techniques with view to informing technology policy and regulation.

The last category of Observers discussed here is that of IT and Management consultants. Their professional interest is to develop and deliver assessments of particular technologies to organisations, on demand. They are placed under the category of Observers because their involvement with the TIDM problem largely relates to the development of systematic methodologies that may broadly be adapted to as wide a range of firms as possible, while it bears little relevance to the decision process and practice itself. Even in cases where the development of assessment frameworks or methodologies is absent, consultants are sourced as advisors. Their role is mainly technical and their professional tenure greatly depends on extensive practical experience and networking with both academic and industry experts.

The reasons that research approaches coming from consultancy were not explicitly discussed in chapter 6 are mainly related to their dispersed nature, their high degree of organisation-specific design and the often confidential nature of consulting work. Furthermore, IT and management consultancy is largely relevant to academic research methodologies, and aims to provide informed solutions to practical problems. The involvement of consultants in TIDM activity is external because their interests lie outside the organisational decision-making activity. Their professional incentives are linked to developing methodologies or frameworks that are legible by Practitioners, applicable in the industry and adaptable across organisations.
To understand the role of Observers in the Actor-based IGT context, the structure of the political organisation of knowledge, addressed in Chapter 2, must be acknowledged. In short, that structure suggests that what is established as knowledge in any academic or practitioner field forms part of a social system of values wherein objectification and, thus, legitimisation is given to transform assertions into established knowledge. It is within that system that Actors both develop their viewpoints (as positions that can be acceptable within a wider value system) and express them. That idea draws broadly on Berger and Luckman’s (1967) framework for the social construction of reality. Disciplines, research communities and professional bodies of experts are such value systems. Observers therefore formulate their viewpoints on the grounds of how sustainable these are within the value system they subscribe to.

On this basis, the viewpoints of the three types of Observers discussed above are objectified by subscribing to the legitimacy of academic disciplines, government-led research communities and expert professional bodies. Whilst serving different interests, the three types of value systems are in principle grounded in their claim to the objectivity of science and expertise. This is because academic research ultimately informs the views of academics, government researchers and consultants alike. According to the Actor-based IGT model, the techniques developed by Observers (see Figure 9.3) are socially constructed outputs of Observer experts’ interests and experience, and thus their subjective judgements of the problem. Their social construction is grounded in the established research processes and agendas of academic or commercial research institutions.

This discussion has demonstrated that the Observers’ role in the social construction of the TIDM problem is equally important as that of Practitioners. In the same manner as Practitioners, Observers develop, legitimise and communicate their own perception on TIDM, based on their interests and experience and formalised within the agendas of their employing organisation. Because of the inherently different approach that Observers and Practitioners have to TIDM, their definitions of the problem are disparate as they are driven by different interests. However, they are not mutually exclusive because of the common educational and professional expert backgrounds that Practitioners and Observers share: an Accounting practitioner is informed by the same theoretical principles that an Accounting academic is. Most importantly, the approaches of Practitioners and Observers are not complementary: the overall TIDM problem cannot be fully synthesised by aggregating the two viewpoints. This is not only because the views of the two Actor classes are defined by mutually incompatible interests, but also because the ultimate form that the TIDM problem assumes is additionally conditioned by the wider beliefs in the socio-economic space about

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7 An extensive discussion on the linkage of objectivity and expertise is provided by Porter (1995).
what is the right way for addressing technological value. This is where the role of the Community of Received Wisdom (CORW) comes into play.

The Community of Received Wisdom: Technological Decisions under the 'Common Mind'

The role and composition of the Community of Received Wisdom (CORW) was briefly explained in chapter 2. CORW is a term used to represent Actors who implicitly participate in the social construction of the TIDM problem through their unaware agreement\(^8\) about what technological value is and how it should be assessed. At a high level, CORW may be seen as the totality of Actors or groups of them who jointly define the wider socio-economic environment, while on a lower level it involves the implicit interactions and relationships between Practitioners, Observers and other Actor groups to reach a collective consensus about how technological value should be defined, assessed and measured.

Unlike Practitioners and Observers, whose identity is defined in relation to the examined problem\(^9\), the key characteristic of the CORW is its universality: The CORW reflects the collective consensus about the aggregate 'state of things' rather than about the TIDM problem at issue. The TIDM problem, as any other socio-economic problem, is subjected to that Received Wisdom because it falls within the concern of the Community’s Actors. Unlike the CORW itself, the taxonomies of the CORW Actors that we use when discussing the TIDM problem are indeed defined by the problem under consideration: the Actors groups that influence the received opinion on TIDM may be different from those taken into account when other problems are examined. Also, the CORW Actor groups are largely unaware of their common identity, unlike Practitioners and Observers.

The reader may identify a connection between the CORW introduced here and the well-documented notion of paradigms, introduced by Kuhn (1962). While not accidental, the relationship is indirect, partly because Kuhn’s original notion of the paradigm mainly refers to the scientific world, but primarily because the CORW is an intellectual configuration rather than a condition, situation or setting, as is the case with paradigms. It focuses on Actors as carriers of a dominant opinion about technological value and considers human agents and

\(^8\) The term ‘unaware agreement’ does not mean that CORW Actors agree outside their knowledge or will. It rather means that their commonly shared opinion on TIDM is not central to their activity, but merely comes as a standard assumption which informs their interests.

\(^9\) A Practitioner is characterised as such because he or she is professionally involved in technological decision-making in a UK financial institution. Practitioners and Observers are given their specific roles in this thesis, with regard to the TIDM problem. That is, should the investigated problem be a different one, we would speak of different Practitioners and Observers. On the contrary, the CORW reflects a universal structure that is independent of the examined problem.
their subjective judgement (rather than formal intellectual groups such as the Sciences) as the driving force for defining Received Wisdom. Received Wisdom populates the common mind through claims to its logic, rational judgement and critical ability as opposed to using claims of scientific truth to persuade a community of specialists. For these reasons, the CORW is a wider and broader intellectual configuration than those underlying the Kuhnian paradigms. While a paradigm can be seen as the outcome of actions and established perceptions, the CORW refers to the individuals and groups whose viewpoints dynamically shape Received Wisdom; the CORW embodies ‘a paradigm of TIDM’, on the one hand, but also represents the intellectual infrastructure within which that paradigm develops.

How collective consensus (or Received Wisdom) is reached within the CORW is subject to numerous possible interpretations. Again, Kuhn’s notion of paradigm development through the transition from experimental to normal science may provide a useful analogue. However, it should be stressed that the process examined here does not take place within a demarcated space owned by experts (such as the scientific world that Kuhn originally refers to) but in the broad socio-economic environment. To reflect that open structure, one suitable representation would be to liken the way that collective consensus is reached to a sequence of exchanges within a market-like structure: a location (both spatial and temporal) where items of intellectual value are offered through an implicit negotiation process, on the basis of their claim to logic, rationality and established Received Wisdom\(^\text{10}\): that space can be termed the ‘market for collective consensus’. That process is continuous and – unlike what the term ‘consensus’ implies - leads to an only temporary implicit agreement about what (in the case of the TIDM problem) is the right way for evaluating technological investments. That agreement is, on the one hand, grounded in the existing consensus on investment valuation, but on the other, is continuously disturbed and readjusted by new opinions in the CORW and the involvement of new expertise in addressing the TIDM problem.

Looking at categories of the CORW Actors will help elucidate the notions presented above. Again, the categories described here do not constitute an exhaustive list but merely provide adequate reference to explain the CORW. It should be stressed once more that these are unaware of their identity only with reference to the TIDM problem. Other than that, they are characterised by group interests, professional status, and organisational missions, which are not directly related to TIDM. It should also be noted that the categories below do not define mutually exclusive groups: CORW Actors may belong to more than one of these. The CORW Actors categories identified here are:

\(^{10}\) In that sense, ‘Received Wisdom’ is an intellectual construct that is dynamically shaped as new perceptions about TIDM come to existence and populate the CORW.
(a) Professionals in the areas of technology or investment valuation with expertise outside financial services. Professionals are not uniquely allocated to a single Actor class: Practitioners with regard to one social problem are Observers or members of the CORW with regard to another.

(b) Individuals or groups whose profession is not directly linked to TIDM, technology investment or generic decision-making areas. Their activity and interests are placed within the wider corporate professional space and, as such, play a role in shaping the collective consensus about the value of technology. Their involvement in the business world brings them into close contact with their peers in financial institutions, the specialist press, expert bodies or other professional communities. Within these relationships, their opinions and understanding on TIDM and the value of technology are formulated.

(c) Professionals in expert bodies such as institutes or professional communities. These are established on common occupational interests and aim to reinforce practices commonly accepted by their members, or to address problems relevant to their industry expertise. The area of Banking and Finance in Britain, as well as internationally is populated by a number of such bodies, whose interests and activities often overlap. These groups comprise experts not only from the categories (a) and (b) above, but also from both Practitioners and Observers. In that regard, expert bodies become a space of interaction and exchange of opinions among experts of all three Actor classes. Because of their professional authority, expert bodies may well be thought to carry greater weight in influencing Received Wisdom than other categories.

(d) Professionals in organisations that deal with valuation of companies for investment purposes; these are inevitably faced with TIDM as a generic ex-post valuation problem, rather than as the day-to-day necessity Practitioners deal with. Their work is to interpret company fundamentals and accounting data in order to either develop advisory investment proposals or make their own investment decisions. Investment Houses and different types of institutional investors belong to this category.

(e) The Stock Exchange, in its role as the stock market mechanism. Stock Exchanges provide the ultimate framework for performing valuation through consensus-making reached in a bid-ask process. In terms of the CORW for TIDM, stock markets can be seen as the space where Received Wisdom about TIDM is, on the one hand, translated into economic value through an implicit negotiation process (bid-ask) and, on the other, is reasserted or weakened through that same valuation process.

11 Examples include the Institute of Chartered Accountants for England and Wales, the Association of Chartered Accountants, the British Bankers Association, the Financial Services and Banking Benchmarking Association, the Financial Management Association International and the European Financial Management Association.
(f) The specialised press in the areas of financial management, accounting, banking, IT systems as well as broader issues of economic interest. That category largely reflects Received Wisdom and plays a dual role of carrying established expert opinions and, at the same time, shaping public perceptions on the TIDM problem.

(g) Private investors who seek advice or guidance from the financial management industry and who formulate their opinions on technological value on the basis of that advice, the views dominating the specialist investment press or word-of-mouth shared among peers in that area.

(h) Independent (non-governmental) regulatory bodies, such as the FSA in the case of the UK financial services. This category refers to Actors who are implicitly concerned with TIDM in financial institutions. The FSA, for instance, is concerned with ensuring that financial institutions perform transparent accounts reporting, secure capital adequacy and adhere to trading and investment rules. These requirements have implicit impacts on TIDM and how efficiently it is performed.

Despite their heterogeneous character, CORW Actors share a number of attributes, including:

(a) They are unaware of their roles in shaping Received Wisdom for TIDM; they do not identify with a cognitive or other societal or professional identity that characterises them as part of the CORW. They are unaware of the existence of the CORW and of their peers sharing the same views on TIDM. For these Actors, TIDM is simply perceived on the grounds of rationality, and their experience and expertise.

(b) They do not view TIDM as a problem, because they identify their perception of technological value as a commonly accepted and unchallengeable truth.

(c) Despite coming from diverse educational and professional backgrounds, they see the established order in TIDM as ‘the right way for appraising technology’.

(d) Members of the CORW Actor categories most often belong to more than one category. An Accounting professional working in non-financial services sectors may, for instance, also be a member of official expert groups such as ACCA or ICAEW and simultaneously be a private investor.

The precise way that the CORW operates cannot be defined through detailed mechanisms. It can only be broadly ascertained through empirical investigation. That is because Actors are not static as to their positions and professional roles; Practitioners in one industry may be Observers for another. Similarly, Observers, when a social problem irrelevant to their specialisation is involved, fall into the CORW. Instrumental roles change in time and space; each Actor has multiple roles with regard to multiple problems.
Conclusions

This chapter presented the total Actor-based IGT framework for addressing TIDM. To do so, it offered a detailed account of the three Actor classes - Practitioners, Observers and the Community of Received Wisdom - by outlining the categories of individuals and groups who participate in these classes. The possible ways that these Actors interact to construct TIDM was also discussed. That discussion offered one possible interpretation of that activity, which although not claiming to be universally true, makes sense of the empirical findings of this research and suggests how the social construction of TIDM is performed.

Overall, the Actor-based IGT framework addresses the roles of Actors in order to demonstrate that TIDM is not isolated within the borders of either industry or academic research; as with all problems in social science, it is influenced by wider prevalent perceptions, which are otherwise seemingly irrelevant and which fall outside the fields of technology valuation expertise. In the course of the explanation that the Actor-based IGT offers, the pertinent role of that expertise is recognised, not as the authority that single-handedly prescribes TIDM, but as an instrument of legitimation of viewpoints that happens in the wider socio-economic context.

The Actor-based IGT framework suggests that the social construction of TIDM is the outcome of the relationship and mutual shaping between established beliefs and perceptions of all three Actor classes. Each class exhibits a particular way for addressing TIDM on the basis of their interests and backgrounds. The framework identifies who Practitioners and Observers are with explicit reference to the TIDM problem; it suggests that, furthermore, should a different problem be addressed through the same framework, different Practitioners and Observers should be taken into account. Moreover, these two Actor classes follow similar structures in the ways they address the TIDM problem, as illustrated in figures 9.2 and 9.3. The CORW - defined as the wider intellectual infrastructure that suggests the broader 'state of things' - has a more subtle role and provides the context within which Actors interact. The CORW's structure for defining TIDM is far less clear, primarily because the Actors participating in the CORW (Practitioners and Observers aside) are not directly concerned with TIDM but merely develop opinions about it as standard assumptions based on Received Wisdom. For the same reason, their expertise plays a lesser role in informing their views on TIDM, in the sense that this role is less explicit in shaping the CORW's unaware agreement on TIDM than it is for Observers and Practitioners.

Implementing the Actor-based IGT framework in this research also led to developing an unambiguous approach to addressing the Anomaly of Practice. This is made through using the Actor-based IGT to illustrate the disparate interests and perceptions of different Actors who participate in (1) the development of investment techniques, (2) the establishment of handbook processes for TIDM and (3) the ultimate delivery of decisions. In that context, it is contended that the different purposes of experts and organisational goals.
conditioning these three activities can explain, to a large extent, the misalignment between them and, consequently, the Anomaly of Practice.

As a final crucial conclusion, the Actor-based IGT framework comes to the support of 'perception-contingent measurement', introduced in chapter 2, as a rationale for delivering more pragmatic technological investment valuation. That notion proposes that improvement of measurement techniques sought within disciplines and research strands are only local, as each can only optimise measurement within its own borders, defined by theoretical principles, interests and research agendas. As a result, the 'improvable measurement' that existing methods support cannot deliver a universally acceptable approach. Conversely, it can only contribute to approaches that become dominant (and thus appear to be universally accepted) depending each time on the CORW's prevailing viewpoint. What is potentially a beneficial contribution to effective technological investment valuation is to elucidate how Actors' roles shape the TIDM problem by taking explicit account of Practitioners, Observers and the CORW. That does not imply adopting the position of the disinterested intelligentsia that Mannheim (1976) proposed, but rather recognising that each effort to address the TIDM problem, this thesis included, operates within the Actor-based IGT framework. It is within that framework that the actual dynamics of interactions, implicit negotiations and interests are revealed and, thus, the social construction of the TIDM problem can be clarified.
Chapter 10: Discussion and Recommendations: Towards a Conceptual Framework for TIDM

Overview and Reached Objectives

This thesis has dealt with the assessment of the value of technology and how it is practically addressed in the UK financial services sector, with particular reference to the appraisal of Internet Banking projects. The core focus of the discussion was the disparity between valuation methodologies and prescribed formal processes, on the one hand, and the observed practice of how decisions regarding new technologies were in fact made, on the other. In analysing this disparity, the discussion questioned the commonly accepted perception that technological investment valuation and technological investment decision-making (TIDM) are connected in a directly reciprocal relationship. This research uncovered no support for the perception that valuation techniques are practically used to assess technologies, or that decisions are taken on the basis of that assessment. Instead, what the empirical evidence suggests is that, contrary to popular belief, there is little relationship between the intended and the actual use of investment valuation techniques in TIDM practice. Similarly, the empirical data demonstrated that established processes for TIDM (called Handbook-prescribed Processes in this work) are followed only inasmuch as the formal organisational decision structures are not challenged. This research found that TIDM practice is driven mainly by the perceptions, interests and power positions of decision-making experts.

This investigation was undertaken from an exploratory perspective, for two reasons. First, a brief review of technological investment valuation literature showed that while a great number of techniques have been advanced, none offers a conclusive answer to the problem
of the value of technology. Because of this observation, it was believed that following the same process of cross-fertilisation of techniques across academic fields would be unlikely to greatly advance our understanding of TIDM practice. Second, past academic research has very seldom addressed the TIDM problem as such, and then only as an implicit part of organisational decisions. Organisational Theorists have historically tended to view investment valuation as the task of Finance and Accounting, while for their part members of the Finance and Accounting disciplines have typically regarded it as part of the quantitatively elusive activity of decision-making that Organisational Theories have been dealing with for the past half century. For that reason, decision-making for technology has traditionally been treated either in its technical sense, through the examination of valuation methodologies, or as another organisational activity that Organisational Theories address. That research gap could only be filled by reviewing empirical evidence outside of the context attached to it by these theoretical attempts. Grounded Theory suggests that this approach is essential in order to avoid becoming entrapped in the assumptions of past theory. At the same time, this research took explicit account of precisely that past theory, viewing it as a key factor that informs the opinions, perceptions and beliefs of TIDM experts (academics or practitioners) as well as the views disclosed in interviews and documented in corporate handbooks.

That wider research rationale was conceptualised early on in the thesis under the term Social Analysis of Technology (SAT). SAT addresses the TIDM problem outside of and beyond the disciplines such as Finance, IS/IT, Economics, Organisational Theory or Sociology which have dealt with it in the past. It does that by offering a differently-informed viewpoint, developed by taking account of past academic and practitioner viewpoints in the light of empirical evidence and following a grounded-theoretical approach. Instead of following the views of any particular social science discipline, it begins from a Management perspective and views TIDM as a practice-driven enterprise. It then implements methods and frameworks that are largely derived from social science fields to analyse findings and recommend solutions. This research does not assert that the SAT approach presents a definitive answer that is superior to past theoretical approaches to TIDM. Rather, it presents SAT as offering a coherent, robust and adequately powerful model for making sense of the shaping of knowledge around and about technology and the social processes that drive our understanding of technological problems. In the same way that SAT has drawn upon earlier research, it too will no doubt in future be subject to revisiting and analysis by newly informed approaches.

The theoretical framework used in this research largely resulted from empirical indications. It is based on a social-constructionist rationale, in the spirit of 'the social construction of reality' that Berger and Luckman (1967) pioneered. It begins from the view that the way the TIDM problem manifests itself is because of, rather than in spite of the differing ways that it is perceived by different experts, and the divergent theories that have
attempted to address it in the past. In other words, these theories implicitly inform the educational background and professional training of those experts, as they are reflected in interviewees' expressed opinions. Thus the TIDM problem is socially constructed as opposed to externally addressed. It does not predate but instead follows the perceptions of those who deal with it. In this research, these participants were termed Actors, and were classified under three categories: Practitioners, Observers and the Community of Received Wisdom.

Using this theoretical framework, the empirical data was reviewed and a series of analytical models developed. The model ultimately identified as best able to elucidate the empirical data in light of the social construction of TIDM was Actor-based Informed Grounded Theory (IGT). This model proposed that each of the Actor classes constructs the TIDM problem through its own distinctive mechanism, where formal processes and established organisational structures are filtered through experts' perceptions. The final shape of the TIDM problem results from the overlapping of these differently-informed understandings of TIDM.

Implementation of the Actor-based IGT and its analytical method would require a revised point of view as to the development of technological investment valuation methodologies. Unlike the currently prevailing approach of 'improvable measurement', where better assessment of technological investments is sought through improved accuracy and quantitative rigour, this thesis suggests the need for a process of 'perception-contingent measurement'. This would recognise that each academic discipline or research strand seeking improvable measurement can offer only partial understanding of the problem. It is proposed that by taking explicit account of all these perception-driven strands a better understanding of TIDM can be reached. Instead of taking an aggregative approach, where existing valuation methodologies or tools are combined to achieve improved measurements, perception-contingent measurement proposes integration, not of the techniques as such, but of viewpoints that are informed by different theoretical principles and assumptions.

The first part of this thesis consisted of an attempt to define, as clearly as possible, the problem of TIDM and explain the value and usability of the Actor-based IGT framework. Part 2 presented the context of this investigation through both a historical account of banking technology in Britain and a contemporary review of Internet Banking. In Part 3, the two main Actor classes - Practitioners and Observers - were reviewed in detail, using both theoretical and empirical evidence, leading to the conceptualisation of the core TIDM problematic through the formulation of the 'Anomaly of Practice'. The fourth and final part of the thesis was devoted to bringing the previous sections' observations into perspective, by discussing in detail the three Actor classes (Practitioners, Observers and the Community of Received Wisdom) and providing an explanation as to how they interact to construct TIDM reality.
Discussion of findings

This section addresses the contribution of this work to furthering our knowledge and understanding of the TIDM problem. Conclusions arising from this work relate to both the theoretical and practical sides of the problem, and the research approaches and methodologies that were used to investigate it. Because of the multidimensional nature of TIDM, and because this research addressed it across and beyond academic disciplines, the research findings relate to a range of issues. These are discussed below.

Practical technological decisions

The most important conclusions of this thesis relate to the practice of technological decision-making. The first regards the role of uncertainty in determining the lines along which TIDM can be performed. Notwithstanding the existence of sophisticated techniques for facilitating decisions, TIDM is far from perfect. In the words of Jerome Ravetz, when "the uncertainties in inputs are not revealed, the outputs of a quantitative analysis become meaningless" (1996). Uncertainty is present at all stages of technological decision-making and the implementation of the chosen technologies. In that regard, two observations are drawn from this thesis.

First, the extensively documented satisficing behaviour of decision-makers may well be attributed to the presence of uncertainty and the knowledge of decision-makers that it is inescapable. Regardless of how carefully candidate technologies are assessed, the working assumptions cannot be ascertained. Evidence of this came from interviewed managers who expressed reluctance to adopt sophisticated techniques in the field of practice. Instead, their decision-making was often based on how acceptable their choices would be to the power centres in the firm, how well they could be defended on the basis of received wisdom, and how they could be supported politically. In this process, uncertainty in its positive connotation becomes a lever for advocating in favour of technological investment: The possibility that benefits from technology may exceed expectations is implicitly embodied in the often inflated assumptions about a project's expected performance, used to justify a higher projected NPV.

Second, the role of uncertainty comes to the fore when addressing the so-called Anomaly of Practice. This thesis suggests that the roots of this anomaly lie in the role of uncertainty and its relation to decision-making and technology implementation. Because of uncertainty, preference for one technological project over another can be advocated on effectively any technical or non-technical grounds. In that process, assessment techniques take precedence, in their demonstrational rather than in their evaluative role: First, their presence in the TIDM process is used to illustrate that rigorous scientific approaches are put to use to inform the decision. Second, their outputs are often engineered by adjusting the
underlying assumptions to fit dominant preferences. Finally, it is proposed that it is because of uncertainty that actual decision-making practice is typically not translated back into handbook processes. Because the benefits of technological implementation take so long to materialise and because success in implementation is defined by multiple dynamic parameters, the factors justifying a previous successful decision become less relevant as time passes. As a result, uncertain benefits delivered at late implementation stages may hold no causal relationship to early decision criteria.

The second step to elucidating the reality of technological decision-making comes with the practical use of Actor-based IGT to address TIDM. The approach provides a coherent analysis of the empirical findings of this research, by identifying that the disparate views of interviewed parties are based on their differently-informed perceptions of TIDM as experts and decision-makers. Because it uses Actors in their dramaturgical sense, Actor-based IGT can identify the roles of academic and practitioner traditions, the disparate motivations and interests that characterise these groups and the way in which they interact to construct the TIDM problem. More importantly, Actor-based IGT highlights the key distinction between the advisory role of Observers (academics, government researchers and consultants) and the decision-making role of in-firm practitioners who are held accountable for their choices. Using empirical evidence, it offers an enhanced picture of the nature and practice of technological decision-making, beyond the ones formalised in academic disciplines; it does this by explicitly recognising that the opinions of interviewed managers embody their educational background and professional training. Finally, it recognises the implicit, but no less important, role of the Community of Received Wisdom (CORW) in conditioning Observers' and Practitioners' views on TIDM. It is through their appeal to the consensus established in the CORW that Observers and Practitioners ultimately justify their perceptions of TIDM as rational, coherent and knowledgeable.

**Actor-based IGT: a new theoretical orientation?**

The second significant conclusion of this work is of a theoretical nature and concerns Actor-based IGT, which was developed following extensive consideration of possible theoretical approaches. These approaches - classed as Disciplinary, Mission-oriented and Tradition-based – were all found wanting, in light of the need to avoid inheriting well-established interpretations of the problem. Instead, it was proposed that by resorting to the original Actor viewpoints disclosed through empirical data, these established organisations of knowledge are accounted for, but not embedded in any new theory that may result from Actor-based IGT.
Actor-based IGT was introduced to address the TIDM problem through its capacity to accommodate a social constructionist view that builds upon the empirical evidence. It differs from Actor Network Theory in that it suggests that only human Actors participate in the social construction of TIDM and, consequently, any artefact, construct or intellectual framework associated with TIDM is used to reinforce the perceptions and viewpoints of human Actors, and is subject to those perceptions. Furthermore, the framework suggests that the viewpoints and perceptions of Actors are informed by past theories for TIDM which are embedded in their educational background and professional training.

The value of Actor-based IGT in exploring the TIDM problem lies in its self-referential attributes: at the higher level, it reflects the fact that this research recognises that past theories of technology valuation inform our current understanding of the TIDM problem: theory and the ways the researcher is exposed to it play a defining role for this perception of the TIDM problem. Similarly, at an individual level, Actor-based IGT acknowledges that TIDM participants themselves are subject to a similar rule: practitioner and research expert groups’ perception of TIDM is informed by their educational and training backgrounds, which emanate from past theory. More importantly, Actor-based IGT is recursive in nature: it offers a generic framework through which new theory can be developed by applying a grounded-theoretical perspective. At the same time, it implies that any such new theory will, in the fullness of time and in the presence of new research or practical interest for TIDM, be subject to a new Actor-based IGT analysis where it is treated as one of the informed opinions of Observers or Practitioners.

The interpretative power of the framework was demonstrated by its ability to make coherent sense of the empirical data: Interviewed practitioners offered disparate viewpoints about technology decision-making, despite wide agreement between them about what the ultimate aim of technological implementation was for their firm. By treating these viewpoints as the point of reference, Actor-based IGT provided an interpretation of these disparities, based on the practitioners' expertise, educational background and professional training. It demonstrated that the experts' implicit perceptions effectively define (rather than simply address) TIDM and the ways that it is practically delivered.

Ultimately, by involving a wide range of Actors in the social construction of TIDM, Actor-based IGT provided a coherent proposition about how that social construction is achieved. It did so by recognising the distinct - but intertwined - roles of Practitioners, Observers and the CORW. The particular value of that classification lies in its ability to underline the different interests and objectives of the three classes, in regard to TIDM. The framework suggested that these interests and objectives, informed by the perceptions of experts (Practitioners or Observers) dictate different understandings of TIDM, and thus somewhat incompatible approaches to it. The third Actor class, the CORW, is characterised by an implicit collective consensus about TIDM and the value of technology at large.
TIDM practice in UK financial services

The empirical data in this thesis provided numerous observations regarding the ways TIDM is actually practiced, and the conclusions reached on this are summarised in the following paragraphs.

This research found that while financial valuation techniques are ubiquitous in handbook processes contained in corporate manuals, they are generally limited to basic methodologies (payback, discounted payback, NPV, IRR) while the wealth of technology-specific evaluation tools available in the literature are very rarely mentioned. Instead, valuation is usually embedded in bespoke procedures, put in place to control the evaluation and ultimately the TIDM process. That practice largely reflects the treatment of new technologies as being mere infrastructure investments. It was apparent from the interviews that the same financial valuation techniques were used as justification instruments, rather than in their intended evaluation role: managers typically adjusted underlying numeric assumptions to fit a desired result, relying on the high degree of freedom that uncertain expected benefits allow. It was further apparent that evaluation tools were used to promote technological projects that enjoy political or strategic support of higher management.

For its part, the Finance function was found to often play a role of a political nature, operating as a buffer to filter-out technological propositions that could not demonstrate economic benefits over a prescribed rate of return. Such thresholds were preset as blanket firm-wide rates decreed by higher management on the basis of wider financial or accounting requirements, rather than technology-related assessments. In that sense, appraisal of technology appeared to be largely driven by the broad structures of financial disclosure (i.e. balance sheet and PLA), an approach that was no doubt reinforced by the strong finance-centred culture of banks.

At a different level, the empirical investigation revealed a pattern of change in the power of Finance and Accounting expertise in financial institutions, through different economic cycles. That was shown by the different decision practices followed before and after the ‘dot-com bust’. Whereas in the years leading up to 2000 technological investments were treated as a necessity to remain in business, and thus made on strategic-only grounds, similar investments are currently subject to rigorous financial control. That change, imposed by changed market perceptions about the potential value of new technology, indicates the increase of the power of Finance and Accounting expert groups in determining the outcomes of TIDM.

At the same time, empirical data suggests that the evolution of expertise in the investigated financial institutions is not unrelated to changes arising from the proliferation of new technologies such as Internet Banking and CRM systems in the sector. There was wide agreement among interviewed executives that the most important expertise banks should
seek is that of business-minded marketing managers who also have a solid understanding of technology. That viewpoint reflected a change in banks’ strategic orientation towards driving customer behaviour through technology, rather than achieving quicker, cheaper and more efficient transaction processing as was the case in the 1990s. Somewhat surprisingly, technology expertise appeared to lose the clout it enjoyed during the 1990s, mainly because of the ability to outsource technological applications or recruit relevant expertise from across numerous industries. That was largely a result of the rise of open platform software applications and the programming flexibility they came with. Notwithstanding these changes, the traditional Banking, Finance and Accounting expertise groups appear to maintain their established power status.

**Integration vs. aggregation of TIDM techniques**

The last issue that this thesis addressed regards possible recommendations about future directions for technological investment appraisal methodologies. Such recommendations could contribute to resolving some of the ambiguities that technology valuation is fraught with. They could also attempt to provide a broader approach than the normative quantitative assessment framework which currently dominates investment valuation efforts. A broader framework would enable decision-makers to identify the particularities of technology as the subject of investment, as opposed to treating it as mere infrastructure. Finally, it could help create a coherent conceptual model for TIDM by taking explicit account of interests, the purpose of the valuation activity by different Actors and, most importantly, the differently-informed perceptions of technological value that serve to define what TIDM is and how it should be done.

It is outside the scope of this work to identify and deliver a detailed practical assessment method for technological investments that is directly applicable and which makes use of parameters past methods did not. Rather, the task of this work has been to highlight the determining role of perceptions, both those embedded in techniques and those informing their use in practice. This research has proposed that TIDM methodologies offer an assessment approach that is informed by the assumptions, perceptions and interests of the Actors who have developed it. As a result, they are only meaningful within that set of assumptions. Secondly, this research illustrated that it is the mechanics of how these methodologies develop and evolve in the Observers’ space that defines their applicability in the Practitioners’ space and prescribes their limitations. Because valuation methodologies are typically developed for the purpose of academic publication, they largely remain within the remit of their originating academic discipline or research strand. Even when they appear to cross these boundaries by borrowing concepts from other research strands, they retain the basic principles of their
parent discipline; they are thus enhanced or otherwise evolved versions of their predecessor techniques. They furthermore have, by virtue of their purpose as publishable research, little direct applicability for ex-ante appraisal in practice.

The traditional approach of technology valuation methods has been to seek improved accuracy by using more detailed mathematical formulae or involving additional parameters. While this does indeed provide enhancement, it is most often done through the aggregation of techniques and concepts that are informed by disparate, and at times contrasting, perceptions of the value of technology. That practice, on the one hand, serves the purpose of providing more complete accounts, but on the other, it often does so by relying on assumptions that are incompatible with each other. Furthermore, because such methods develop within different disciplines, no unanimous agreement can be reached among them about 'one best way' for technological valuation. Each discipline or research strand promotes its own 'best way'.

This research recommends an alternative to the aggregation approach, suggesting that a coherent approach to addressing TIDM - both in terms of method development and practical application - should recognise explicitly a number of things. First, that valuation methods developed in the Observer space carry the assumptions and perceptions of the research strand from which they stem. Second, that because multiple research strands provide TIDM methodologies, these are naturally at odds as to their aims, underlying assumptions and theoretical principles. Third, that because the TIDM problem is socially constructed, a fuller understanding of it may only be reached by taking into account the Actors who participate in it. TIDM appears as it does because of (rather than in spite of) the methodologies developed for addressing it, the assumptions prescribed in organisational processes for it, the perceptions of Practitioners performing the decision-making activity and, finally, the received wisdom about what TIDM is and how it should be done. Recognising these necessities, the wider approach to the TIDM problem recommended by this research calls for the integration of existing methodologies into frameworks that explicitly recognise their context, their purpose and the interests of Actors as developers and users of these methodologies. This is the integration approach. It is distinct from the aggregation approach described above, in that, instead of neglecting disciplinary boundaries, it attempts to identify them and acknowledge disparities across them. It also goes deeper into looking at how these methodologies are likely to be practically used by differently-informed experts in organisations and how the credibility of these methodologies is established within the wider socio-economic space defined by the CORW. In following these guidelines, the integration approach identifies conflict between research strands as well as between practitioner expert groups and recognises the importance of political negotiation in practical decision-making.
Practical implications

As a final point, implications of this research for practice in TIDM are addressed. These are presented here as a recommendation that follows empirical observation and the application of the Actor-based IGT in this research. In that regard, these observations are addressed to the professional practitioner and decision-maker.

- **Involve the right knowledgeable people in the process**: Valuation tools are used to derive numeric benchmarks. However, these can only be estimates and should be treated as reflections of the degrees of belief in the set of assumptions that underlie the specific use of any evaluation tool. Techniques as input-output instruments are conditioned to provide any result, provided that the assumptions are rational and defensible. Outputs of valuation tools largely reflect the perception of experts who implement them, and because of that, it is essential that experts involved in TIDM have a holistic view of the problem.

- **Make sure that high quality data are available**: In practice, the justification of inputs takes precedence over the actual outputs. For this reason, knowledge of parameters used in valuation is essential. Assumptions are most often based on speculations about aspects as uncertain and malleable as customer numbers, efficiency of system usage and timeliness of economic returns. Ensuring these assumptions are realistic is crucial.

- **There is no ‘magic bullet’**: No matter how sophisticated valuation techniques are, they do not provide outright conclusive measures. Experience suggests that assumptions will in fact be negotiated, not merely on the basis of how coherent they are, but also on the grounds of who is backing the project. In that regard, the political power and kudos of managers comes into play.

- **Ensure that the right mix of expertise is available**: Assigning TIDM to any set of experts will inevitably lead to decisions that embody their informed perceptions of the problem. It is essential that different specialities have a say in the process. It is also necessary that expertise not available in house be brought in to facilitate the process.

- **Engage influential centres to the idea**: Because TIDM is ultimately a political process, attracting interest from powerful individuals or groups is crucial to supporting a proposition. Because decision-makers are by default accountable for their decisions, their position is necessarily politically charged: To promote their views, they need to rely on support from their departments, expert group or peers.
As a general comment, this thesis suggests that improvements in the practice of TIDM are unlikely to come through aggregating existing measures, techniques or assessment methodologies. The devil is most emphatically not in the detail. Valuation tools, no matter how rigorous, will necessarily become absorbed into formal handbook processes whose outputs are conditioned by interests. Improvable measurement will always be inconclusive as regards TIDM practice, mainly because deriving new techniques doesn't really make any provision for mitigating the political nature of input assumptions. This is because uncertainty is inescapable. Instead, technological investment valuation needs to be accounted for within a wider practical framework that explicitly recognises interests, power structures, the particularities of implementation, experts' opinions and the traditions that inform them. That approach would achieve a more realistic understanding of how the value of new technology is defined in reality.

Limitations and further work: towards wider applicability of Actor-based IGT

As with all research attempts, the present work comes with its limitations. These are briefly presented here as a concluding comment. It has been stressed throughout this thesis that the frameworks and taxonomies recommended are by no means universal or unique. The classification of Actors into Practitioners, Observers and the CORW in chapter 2 is sufficient for these purposes, but it is far from being an exhaustive classification. Similarly, while the categories of research strands identified in chapter 6 cover the bulk of relevant TIDM techniques, it is not in any way implied that they are the only ones. Neither is the list of Practitioner expert groups disclosed in interviews in chapter 7 definitive. On these matters, the position of this thesis is that exhaustive or universally complete accounts are impossible to develop. The intellectual constructs being addressed here (i.e. expertise, Actors' roles, perceptions etc.) are of dynamic nature that cannot be determined in detail, as they are in a state of continuous change. Even when they are reached, exhaustive accounts are of little use for this type of exploratory research.

Minor limitations were introduced by the choice of methodological approach. To accommodate the investigated subject, case studies did not focus on specific Internet Banking projects, therefore possibly missing out on details relevant to parameters that influenced TIDM at times. That limitation was taken on board early on during research design when a conscious choice was made that, when focussing on expert group perceptions of TIDM, delving into the particularities of any one technology project would offer little to the task of disclosing these perceptions. The detail of the actual decision-making
process for any specific project can very rarely be conclusively disclosed in a series of interviews for two reasons: facts may be opaque to interviewees because of decision complexities, especially when they are not members of the higher management, and the actual process is often of a sensitive nature and therefore not easily disclosed.

Limitations were also imposed as to the comparability of the approach suggested in this thesis with respect to existing TIDM techniques and approaches. These limitations mainly arose because of the interdisciplinary nature of the research and what it attempts to achieve. On the one hand, this thesis deals with a problem (technology investment valuation) that has traditionally been considered an area 'owned' by quantitative traditions such as Finance and Accounting. On the other, it also addresses a problem (decision-making) that has typically been the subject of disciplines such as Organisational Studies and Cognitive Psychology. The objective of this research has been to make sense of the linkage between the two problems with a view to addressing the wider problematic of the value of technology. The immediate limitation arising from this approach is that it does not, naturally, introduce new normative assessment tools that would replace or complement the existing TIDM techniques. As a result, the approach provided in this thesis is not comparable with such techniques in terms of accuracy or performance and thus cannot be examined on that basis. On the contrary, it aims to elucidate the process-practice disparities and offer a conceptual framework for looking at TIDM transparently, rather than locating and correcting measurement errors or omissions.

Finally, this work examines the possibility for the Actor-based IGT framework to expand beyond the field of technological investment decision-making, into addressing social interactions of a different nature. The major obstacle to this would appear to be the fact that the Actor-based IGT framework, in its detail, relies on the existence of explicit structures within which Actors interact: apart from the CORW, where interaction is implicit, the roles of both Practitioners and Observers are defined within clearly demarcated organisational structures or professional groups. For each of them there exists a prescribed role or function in reference to which Actors are assumed to carry out their professional tasks. Their deviation from prescribed processes gives rise to the Anomaly of Practice. These prescribed processes are part of the Actor-based IGT model as they become subject to Actors’ informed perceptions. By contrast, social interactions outside the organisational setting (such as, for instance, personal decision-making) lack the presence of such structures. Although one could claim that differently informed backgrounds do play a role in how personal decisions are formed, there is most often no explicit structure other than the CORW within which Actors can be defined relative to the problem. The Observers’ space may only be present if the problem is of an organisational nature, of public interest or of wider socio-economic value, to an extent that it makes it interesting as a research subject, important for policy, or
exploitable in economic terms. Extra-organisational activities therefore cannot easily be addressed through Actor-based IGT as it stands.

This limitation, however, has positive connotations as to how the framework can be used to address organisational decision-making that is not necessarily related to technology. This is because any organisational decision bears the main characteristics of TIDM: Practitioner experts always bring their own informed opinions to the problem at hand, on the basis of their experience and knowledge; similarly, Observers (academics, consultants or government researchers) offer their own interested approaches to the same problem; finally, there always exists received wisdom about a problem in the shape of a wider conviction about how it should be addressed. Therefore, adapting the Actor-based IGT to other organisational decision-making problems may be achieved by identifying the Actors and addressing their perceptions. Whether such adaptations are practically plausible is subject to further empirical research.

The Social Analysis of Technology (SAT), introduced in this thesis, does not claim to provide final answers as to a 'right way' to reach technological decisions or indeed about addressing the wider TIDM problem. On the contrary, it embodies the strong probability that, in the fullness of time and in the presence of newer research or other interest, it will itself be subject to readdressing from another research area. SAT and the Actor-based IGT approach explicitly propose that future improvements are inevitable, even if these are not predicted, as it treats empirical observations in their dynamic social context.
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