AN EMPIRICAL INVESTIGATION INTO WICKED OPERATIONAL PROBLEMS

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I certify that all the material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

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ABSTRACT

This thesis begins by considering the nature of research in Operations Management, the methods that are employed and the types of problems it addresses. We contend that as the discipline matures and it extends its boundaries the research challenges become more complex and the reductionist techniques of Operations Research become less appropriate. To explore this issue we use the concept of wicked problems.

Wicked problems were developed by Rittel and Webber during the 1970's. They suggest the existence of a class of problems which could not be solved using the techniques of Operations Research. They describe Wicked Problems using ten properties or characteristics, which, after a thorough review of their descriptions, we have condensed to six themes.

We consider the current state of the "Wicked Problem" literature and have identified the paucity relating to Operations Management. Thus we develop our research question: "what are the characteristics of wicked operational problems?"

We investigate this question using a single extended case study of an operation experiencing significant unresolved performance issues. We analyse the case using the tenets of systems thinking, structure and behaviour, and extend the empirical literature on wicked problems to identify the characteristics of wicked operational problems.

The research indicates that elements of wicked problems exist at an operational level. The significance of this finding is that reductionist techniques to problem solving e.g. lean and six sigma may not be applicable to the challenges facing operational managers when confronted with the characteristics of a wicked operational problem.

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AUTHOR'S DECLARATION

This study was conducted as part of a larger research project conducted within the case organisation. The author acknowledges the contribution of the following parties to this research:

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This research consists of 3 overlapping themes: operations management, problems and systems thinking. These themes run through the researcher's professional career within financial services in such diverse areas as strategy, analysis, mergers and acquisitions, performance improvement, operations and design, quality, BPR, and internet banking. The main commonality of these areas, other than the inevitable and necessary human interaction was the constant presence of change and problems, simple or otherwise. As noted by Rummler and Brache (1995), systems are hard to change; and as noted by Rittel and Webber (1973), some problems may never be solved, only "re-solved – over and over again" (p160). This research provides an opportunity to place that experience within a wider theoretical context.

This chapter introduces the topic and scope of this research and explains the structure of the thesis. It sets out the research context, and outlines the rationale for the research leading to a statement of the aims and objectives of the research. The significance of the study is reviewed. Finally, the structure of the thesis is set out and the remaining chapters briefly summarised.

This chapter is set out in the following sections:

1.2 Context and Rationale for the research

1.3 Research Aims and Objectives

1.4 Organisation of the Thesis

1.5 Concluding Remarks

1.2 Context and rationale for the research

1.2.1 Introduction

The context for this research is the changing nature of operations within an increasingly complex environment. These environmental changes provide opportunities for development to the Operations Management (OM) research community which remains focused on manufacturing and theoretical modelling techniques (Slack et al., 2004b, Hill et al., 1999). The challenge is to retain and increase its relevance to practitioners.

Systems thinking has influenced the development of OM in two ways: in providing topics, such as for example, Supply Chain Management with a conceptual vocabulary such as "relationships" and "boundary"; and more fundamentally in the use of techniques such as Operations Research/Management Science (OR/MS) and system dynamics. There is a historical overemphasis in OM on mathematical and modelling techniques, as evidenced for example in the review of OM publications presented by Filippini (1997) and Bayraktar, et al., (2007). More recent OM research is frequently focused methodologically on statistical models which purport to understand the impact of OM principles on performance and suffers from the 'serious restriction that any normative or predictive claims must be made with ceteris paribus restrictions placed on them' (McCarthy et al., 2010, p605). However, it is widely recognised in the systems thinking community that OR/MS techniques tend to be reductionist and develop deterministic models and are only appropriate for dealing with closed systems (Jackson, 2006), rather than those exhibiting "organised complexity" (Weinberg, 2001).

The challenge facing OM research is the expansion of its domain through the widening of internal and external boundaries, the increasing complexity of relationships, and the increasing recognition of the open-ness of its systems, to which the prevalent techniques of MS/OR appear ill suited (Sousa and Voss, 2008). This places the discipline much more firmly within the zone of "organised complexity", where systemic rather than reductionist thinking is more relevant (Gregory, 2007). We consider that existing OM design and improvement techniques may not be appropriate to problems within this zone and that many current and future challenges for OM may not be amenable to reductionist techniques or closed systems thinking. There is therefore a need to consider the types of problems and the assumptions underpinning OM interventions and improvement, recognising that some problem techniques can be addressed with OR/MS, and that some cannot (Muller-Merbach, 2011).

It is this challenge that this PhD seeks to address. We recognise that this is an ambitious and demanding undertaking that is clearly beyond the scope of a single PhD. However, this thesis is an initial exploratory case which builds theory about the characteristics of operational problems that are not amenable to existing reductionist methods. To do this we use a framework of wicked problems (Rittel and Webber, 1973) and thus our research question is "*what are the characteristics of wicked operational problems?*"

The primary context for this research is Operations Management, and the analysis of a particular set of operational problems, but obviously other lenses and methodologies could have been pursued. For example an interventionist approach based more explicitly on systems thinking and associated systems practices could have taken the research in this case study beyond analysis and into the practical realities of change. However the prime purpose of this research was for a detailed analysis of a problem situation prior to any selection of a change methodology which would have influenced or driven such a choice.

We will now introduce two key conceptual foundations of this research: Operations Management and Systems Thinking.

1.2.2 Operations Management

The domain of OM covers the design, control and execution of operations in both manufacturing and services (Bertrand and Fransoo, 2009). Over recent years the subject has developed and expanded from factory management to a wider role within the organisation covering strategy, and outside the organisation through the expansion of supply chain management. It is widely considered to be a practical discipline seeking to provide answers to "concrete problems" (Slack et al., 2004b).

Slack, et al. identify a wide divergence between the over representation of manufacturing content in OM research, compared to its role in the real economy which is distinguished by the growth and predominance of services; they call for a deeper and more representative base to OM research which would enhance its relevance. They note that over the previous 14 years only 10% of research activity has been directed towards 80% of operations activity. The predominance of service in the economy is not reflected in research (Machuca et al., 2007). Future challenges such as globalisation, virtualisation and networks will similarly challenge OM research to maintain its relevance (Bayraktar et al., 2007).

The challenges facing the OM research community are in maintaining and increasing the relevance of research to current issues, and the need to respond to future developments. Specifically, leading authorities such as Corbett and Klassen (2006) have recognised how OM has expanded the boundaries of the discipline from, for example, optimising inventory control to include reverse logistics. Others have called for OM researchers to consider the integration of OM with Marketing (Boyer and Hult, 2006), and Human Resources (Boudreau et al., 2003) and the expansion of the discipline boundary to include the customer (Smith et al., 2011).

1.2.3 Systems Thinking

Systems thinking, inspired by work on the commonality of scientific approaches by von Bertalanffy (1950) originated as a developing area in the late 1940s. Systems thinking is concerned with the study of wholes and the relationships of parts within them; "the systems approach focuses on the considerations of wholes and of their relation to parts" (Muller-Merbach, 1994, p16). Ackoff (1980) gives the following reasons to study systems: improve the way they fulfil their purpose ("self control"), the purpose of the parts ("humanisation"), and the purposes of the wider system ("environmentalism"). Systems Approaches to problem solving followed from this original developmental work in systems thinking.

Systems thinking uses the following concepts to one degree or another: black box, feedback, control, communication, variety, hierarchy, recursion, viability, autonomy, environment, autopoiesis, self-regulation, self organisation, learning (Jackson, 2003). Churchman (1971) identified the following nine conditions for a thing to be considered a system: goal seeking, or purposeful behaviour, a measure of performance, a client (customer), teleology, an environment which co-produces the performance, a decision maker, a designer, the designer's intention (to manage the system to the benefit of the client), and stability. Interconnectedness, and the relationships of the parts are further important concepts (Beer, 1984). For systems theorists the relationships between the elements are just if not more important than the elements themselves; and the interconnections between the parts should be considered as more important than the parts (Forrester, 1961).

Systems thinking, and the use of the "system" concept acts as a useful lens through which to view and frame reality, but the term system is an epistemological one; "[t]he concept of a system is an explanatory device" (Checkland, 1992, p1028). The advantage of taking a systems approach to the examination of an operation is the opportunity to study the operation and its behaviour as a whole and in context. A systems thinker considers that organisational and behavioural patterns are repeated in many different areas of study. These patterns are considered to be subject to some set of general laws, the knowledge of which would allow solutions of problems in one domain to be applied in another (Weinberg, 2001).

Systems thinking stands opposed to the principle of reductionism. A reductionist conceptualisation seeks to analyse, understand or improve its topic of enquiry by breaking down the whole and examining the parts. This can lead to sub-optimisation when managing or improving performance (Gregory, 2007). For reductionism to be effective the connections between the parts must be weak; the relationships must be linear so that parts can be summed to the whole; and then optimising each part will optimise the whole. The theory of second best suggests that if one optimal condition is not satisfied it is possible that the next best solution will involve other variables moving away from their positions of optimality (Lipsey and Lancaster, 1956 -57).

Within the context of systems approaches it can be seen that their main purpose is in the analysis and resolution of problems. Systems thinking is a style of thinking, reasoning and problem solving. It starts from the awareness of systemic qualities in a given problem. As pointed out by Jackson, as problem situations develop by becoming more complex diverse, and dynamic, managing them becomes more difficult (Jackson, 2006). A general classification of systems approaches, the System of Systems Methodologies, in which systems approaches and thinkers are positioned according to the perceived nature of the problem (simple to complex) and the range, nature and viewpoints of the parties involved in the problem, has been provided by Jackson (2006).

Systems thinking has a long history of influence on Management (Jackson, 2009), and OM (Sprague, 2007). These influences have been directly within the operation, as for example, the use of "hard" Operations Research (OR) for organisational efficiency, or in the use of softer methods, for example soft systems methodology (Checkland, 1981), applied to improve more general management practices (Jackson, 2009). In spite of this influence, reductionist manufacturing improvement and analysis techniques remain prevalent in OM (Filippini, 1997).

1.2.4 Wicked Problems

A problem may be considered an "unwelcome situation". Problems that are difficult to solve using traditional "scientific" OR tools have long been recognised in some disciplines. These may be typified as not sufficiently well defined, involving more than one party, lacking data, and needing agreement to a chosen course of action (Mingers, 2011). These problems are often opposed to more easily solvable ones using a binary description; e.g. hard / soft (Checkland, 1981), problems / messes, (Ackoff, 1979), technical / practical (Ravetz, 1971), high ground / swamp (Schon, 1987), ill structured / well structured (Simon, 1973), tame / wicked (Rittel and Webber, 1973).

Wicked problems are a "concept" developed by Rittel and Webber (1973) which formed part of the obstacles or dilemmas which they claimed would prevent the development of a general theory of planning. The first of these properties is that "there is no definitive formulation of a wicked problem" (p161). The analysis describes the binary opposing qualities of tame problems – those that are easy to solve, and wicked problems – those that are difficult or impossible to solve, and sets out the reasoning behind this in the form of 10 properties or characteristics.

The discussion on wicked problems is about structure of problems and the relationships between their elements. For example, Rittel and Webber claim the initial identification of a problem is a normative statement dependent on the viewpoint of the problem "owner". The nature of any perceived solution forms part of the initial definition of the problem and guides subsequent solution finding activity. Their explanations of wicked problems did not provide a detailed methodology for problem understanding or intervention; their analysis did however include the effects of the wicked properties on the intervention, for example it would be a "one shot operation" with potentially unintended consequences.

Rittel and Webber's exposition of the dilemmas and setting out their implications was a reaction to attempts to create a general theory of planning which would be applicable in a wide range of domains. This was stimulated by the perceived increasing complexity of problems, and the apparent failure of currently existing methods of OR, such as systems analysis, to provide satisfactory or definitive solutions. Attempts to use such techniques in planning domains had proved unsuccessful (Flood, 1989). Farrell (2011) attributes the concept of wicked problems as being due to a necessity to "describe a new category of intractable late industrial problems associated with modern social planning" (p75). Rittel gives two principal reasons for the failure of what he called this first generation systems analysis: the first being the issues presented by wicked problems, and the second being the paradoxes or dilemmas attached to rationality (Rittel, 1972). Rittel suggests that what is required is not a general theory of planning, but a more intuitive, normative, discursive and political approach.

Can a wicked problem be tamed and hence become amenable to the application of scientific or reductionist and linear techniques? Churchman (1967) and Rittel and Webber (1973) suggest that it might be possible. Farrell (2011) is less convinced – "the very idea of 'tackling' wicked problems is absurd...[and] reflects a classically modernist, industrial problem solving mindset, whereas wicked problems are, by definition, unsolvable conundrums for the modernist planner" (p75). Attempts to "solve" wicked problems involve a multitude of tools and methods to recognise the nature of the problem through a process of structuring and discourse (de Tombe, 2002).

It is unclear what the extent of the domain of wicked problems is. Churchman (1967) raised the unanswered question implicitly posed by Rittel concerning the extensiveness of wicked problems. Rittel and Webber suggest that the wider the boundary is drawn around the problem, the more other problems become drawn in. Churchman's own suggestion was that most problems would be wicked, leaving just the "nursery" as the place for tame problems. If this is true, and for example a chess game can be wicked, as well as, for example, climate change, then it is possible that "wicked problems" may not, as is the traditional approach within the literature, be purely seen in planning and design contexts which are large and of social importance, and which contain multiple viewpoints (Coyne, 2005).

While it might be argued that concepts developed in the early 1970's means that their analysis has no current relevance, there is also a clear argument in the literature opposing this view. Rith and Dubberley (2007) maintain that wicked problems and their dilemmas remain significant because of the description of the issues and the nature of the proposed solutions.

1.2.5 Research Opportunities

One role of existing research is to guide and stimulate new research (Siggelkow, 2007) which needs to be thoroughly based on existing knowledge (Eisenhardt, 1989), (Schmenner and Swink, 1998). Within OM, this opportunity is challenged by the lack of theory (Schmenner and Swink, 1998), and the lack of a single disciplinary base (Slack et al., 2004b).

OM research should reflect the practical and pragmatic nature of operations management, which necessitates the role of research to be multifaceted (Slack et al., 2004b). "In order to be useful to managers and to future scholars, researchers need to help managers understand the circumstances they are in. Almost always this requires that they also be told about the circumstances that they are <u>not</u> in" (Carlile and Christensen, 2004, p29, emphasis in original).

Part of the role of research is to focus and stimulate action and assist management in addressing problems which it might prefer to avoid (Worley, 2009). This practical use of research is reflected on by Bertrand and Fransoo (2009), who wonder why researchers do not address more practical problems and why practitioners do not make more use of theoretical tools and results.

This research should be controllable and usable by practitioners rather than technique based (Kouvelis et al., 2006), and the research should be more relevant and appropriate to the problems involved in managing operations effectively, rather than being based on models relevant only to limited sets of technical problems (Sprague, 2007). It has been argued that, given the perceived lack in OM of a single disciplinary base, potentially a better role would be not to act as a discipline but as a "knowledge broker" between practitioners and researchers (Slack et al., 2004b).

More research should be systems based rather than reductionist, engaging with real world problem situations (Sousa and Voss, 2008, Checkland, 2010), in order to meet the growing demands on OM, such as its expanding domain, and the increasing complexity of relationships covered. Researchers call for applied projects with more emphasis on information, networks and multi-agent systems, involving multidisciplinary studies looking at processes and improvement (Kouvelis et al., 2006). Other researchers identify the need for more interdisciplinary work on intra and inter organisational interfaces (Gupta et al., 2006), and which reflects the growing demands of globalisation, virtualisation, and information processing (Bayraktar et al., 2007).

1.3 Research Aims and Objectives

This research begins by recognising that OM research has often historically characterised its problems and challenges as closed systems, to which it can apply the techniques of OR/MS. However, OM is becoming more complex as boundaries are expanded and interfaces with other disciplines are developed and this calls into question the application of the techniques of OR/MS. What is required is a characterisation of the problem that OM researchers are seeking to address. In this way, we may be able to identify the class of problems to which OR/MS is suitable and those which it is not. The framework we use to understand and explain the nature of the class of operational problems, is that developed from Rittel and Webber's (1973) descriptions of the characteristics of wicked problems. As we shall see in Chapter 3 the literature on wicked operational problems is scarce and provides no basis for identifying where OR/MS is suitable and where it is not.

This gap in the literature provides the basis for our research objective which is to seek to identify and understand the nature of wicked problems in an operational context. We will do this by adopting a systems approach based on examining structure and behaviour. We will conduct an in depth case study of a single operation which is exhibiting significant and unresolved operational issues.

We will seek to address the research question, "What are the characteristics of wicked operational problems?" by deriving and operationalising themes from the 10 properties or characteristics representing wicked problems presented by Rittel and Webber and examining and exploring their relevance empirically.

1.4 Organisation of the thesis

1.4.1 Introduction

The research is conceptualised in 3 phases. The first phase of the research, through employing the practices of systems thinking and drawing parallels with existing thought on wicked problems, identifies opportunities for the extension of knowledge in OM through the identification of features of wicked problems in operational systems. The second phase engages empirically with this phenomenon through immersion in a complex underperforming operation. The research uses the systemic themes of structure and behaviour to examine firstly the geographic and operational design, and then the processing performance of the operation to identify the characteristics of the operational behaviour. The final phase brings together the themes and the empirical data to test for evidence of the themes.

The thesis is arranged in 10 chapters. An overview of the research process is set out in Figure 1.1, Overview of Research Process. Each chapter is briefly described below.

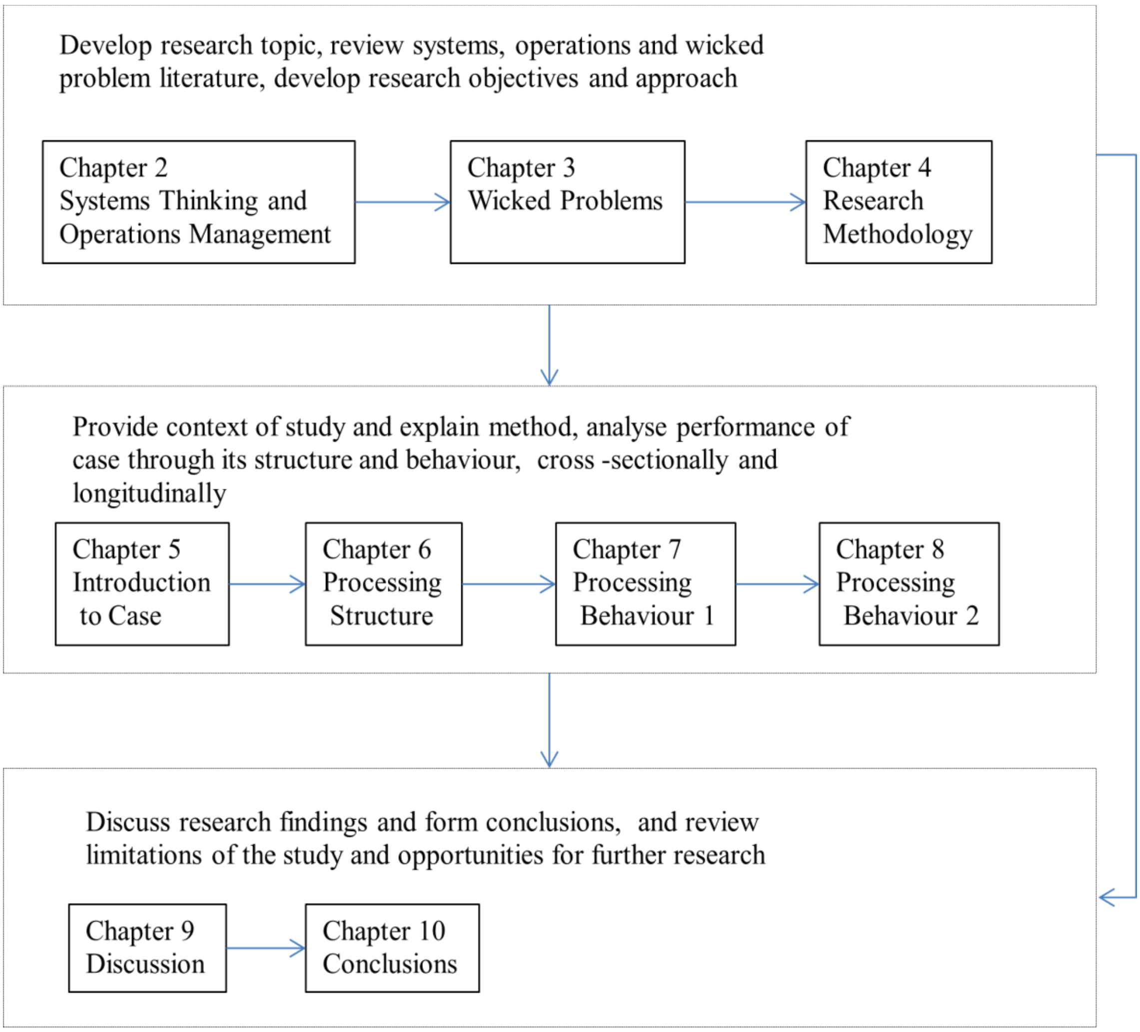

Figure 1.1 Overview of Research Process

1.4.2 Chapter 2: Systems Thinking, Operations Management and Systems Approaches

In chapter 2 we introduce the development and key concepts of systems thinking, and systems theory. Following this the development of OM and the way in which it has been influenced by systems thinking is considered. The chapter concludes with an examination of ways in which systems thinking and approaches can be categorised, such as by underlying discipline, historical development, or problem complexity.

1.4.3 Chapter 3: Wicked Problems

This chapter introduces the analysis of wicked problems proposed by Rittel and Webber (1973). The origins, development and application of the analysis are reviewed. A model based on the characteristics of wicked problems is developed and the key themes underlying wicked problems are explored, and operationalised. The empirical work using wicked problems as its basis is examined. From this work a research objective and a research question are developed.

1.4.4 Chapter 4: Research Methodology

Chapter 4 reviews the potential research methodologies available, and research methodologies within OM. The nature of research is explored and an approach using a single case study is justified. A research design is described and justified.

1.4.5 Chapters 5, 6, 7, 8: Data Analysis

The data analysis for the research is set out in 4 chapters which cover the introduction of a new scheme for agricultural subsidy payments into a public service agency, which results in significant performance issues which prove difficult to resolve. The reasons for this are examined using a systemic approach examining in sequence the structure and behaviour of the processing operation both cross-sectionally and longitudinally.

Chapter 5 introduces the case in more detail. It covers the role of the Rural Payments Agency within the United Kingdom and European Union agricultural and environmental policies, and the rationale for the introduction of the Single Payment Scheme (SPS). The nature of the various SPS schemes is considered. The extent of parliamentary and other scrutiny is also examined.

Chapter 6 examines the geographic, organisational and process structure of the case within its organisation using a recognised process mapping technique, IDEF0. The methodology to investigate and describe and analyse the processing structure is justified within the chapter. Issues around the process and its structure and elements are discussed.

Having examined the structure of the processing system, chapter 7 analyses the behaviour of SPS in order to determine the cause of its poor performance. This is done initially using root cause analysis investigating the causes of error in a cross sectional single year sample of cases. The results are reviewed, and in particular the relationships between causes and effects. The methodology to perform this review is again justified within the chapter.

Chapter 8 extends the analysis of the behaviour of the processing system to a detailed longitudinal review covering a number of years of a smaller sample of cases reviewed in Chapter 7. This is undertaken to confirm the causes for poor performance identified in the earlier chapters, and identify further less obvious causes. In line with other chapters justification for any methodology used is made within the chapter.

1.4.6 Chapter 9: Discussion

This chapter summarises the findings from the four data chapters. The empirical data is analysed against the six themes underlying wicked problems derived in chapter 3 to address the research question. Evidence for four of the themes is found within the structure and behaviour of the processing operation, and a model is developed to show the impact of the themes within the operation. The contributions of the research are set out.

1.4.7 Chapter 10: Implications and Limitations

This chapter summarises the research carried out and assesses its contribution. It includes a section of reflection on the research process and its impact on the researcher. Limitations of the research and the research process are discussed. Areas in which further research could be conducted are also considered.

1.5 Concluding remarks

This introductory described the outline of the thesis, by introducing the research problem and issues. The methodology has been described briefly and the shape of the thesis outlined. We are now in a position to continue by introducing the broad outlines of systems thinking, and its relevance to OM in chapter 2.

CHAPTER 2

SYSTEMS THINKING, OPERATIONS MANAGEMENT AND SYSTEMS APPROACHES

2.1 Introduction

This chapter introduces the concepts of systems and systems thinking, and explores some of the key concepts which underlie this area. It continues by examining how systems thinking has been applied to Operations Management (OM) and how systems thinking has been developed to include its application to wider social issues.

This chapter is set out in the following sections:

2.2 Systems Thinking

2.2.1 What is a system?

At its simplest, a system is a set of things related to each other; and systems thinking is about the study of how things are related, rather than a study of what they are made of (Forrester, 1994, Weinberg, 2001, Mesarovich et al., 2004). The members or the system or set (e.g. parts, elements, components, variables) is one of the key underpinnings of systems thinking and set membership is defined by the observer

(Weinberg, 2001); it is important that the components, their relationships and interactions are capable of being defined sufficiently accurately (Ball, 2004).

The nature and strength of the relationships between the elements is also stressed: Buckley introduces a time element and some circularity, indication that a system is a causal network that is reasonably stable over a given period of time (Buckley, 1967). These relationships have effects on the elements of the set and on the system itself. Ackoff suggests that each element can affect the behaviour of the system and other elements, and no part of the system is independent. This focus on the parts and whole allows for different viewpoints to emerge. Viewed structurally it is divisible, viewed functionally it is not; some of its essential properties may be lost if it is taken apart (Ackoff, 1980). The parts may be systems themselves within their own definable boundary but the overall behaviour of the whole system needs to be recognised (Mesarovich et al., 2004).

In summary a system is made up of interconnecting parts whose relationships affect their own behaviour and that of the system as whole.

2.2.2 Systems zones

Systems are often described as existing in 3 zones, depending on behaviour and how predictability is achieved by theory, with different theoretical and analytic approaches being relevant to each (Weinberg, 2001). For example Weinberg uses descriptors of large, medium and small. The small number zone consists of those sets whose members are low in number and low in complexity. He uses as an example Newton's treatment of the solar system, in which the laws of motion are used to predict planetary positions, The large number zone, which ranges from low to high complexity, can use statistics to form theories and make predictions, and the law of large numbers, is based on randomness, in which any complexity is unorganised so the behaviour is sufficiently regular.

The third zone, the "medium number zone" is where the complexity is organised, which will lead to unexpected outcomes and large fluctuations from any theoretical predictions. This, claims Weinberg, is where a general systems approach can be used. Most importantly organisational and social systems exist in this zone. This may be represented diagrammatically as set out in Figure 2.1 below.

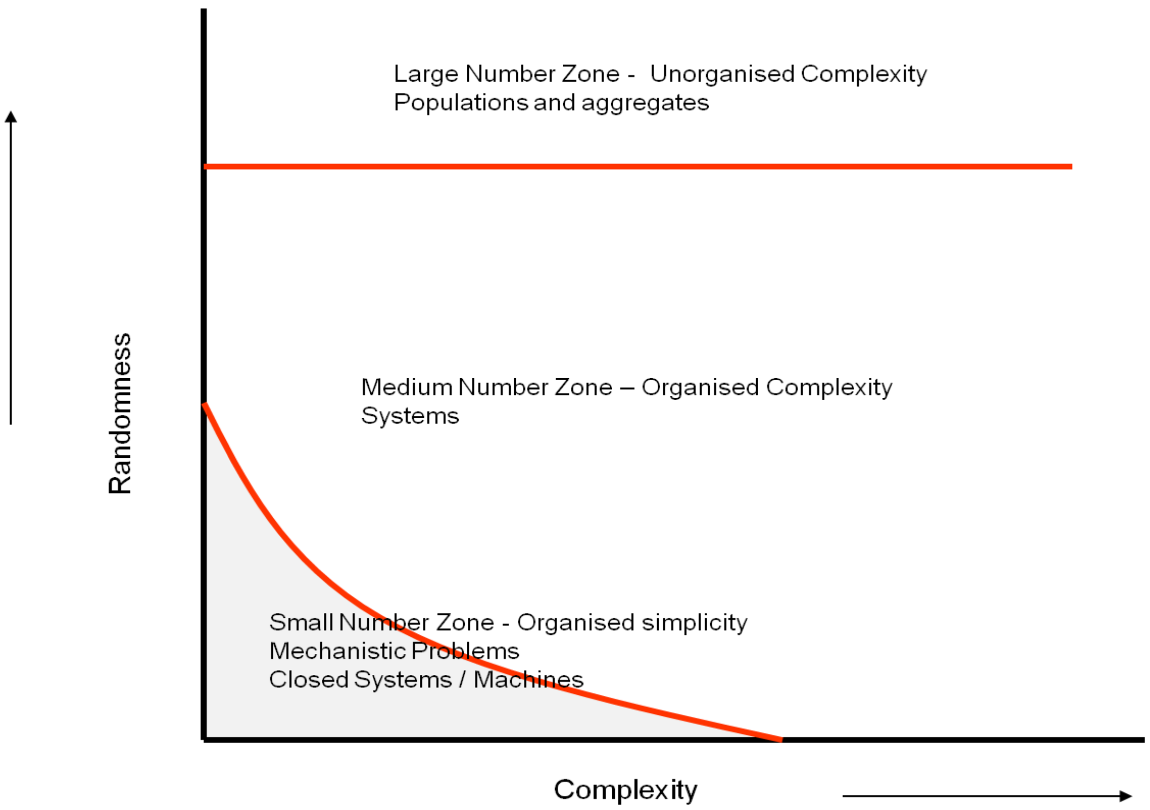

Figure 2.1 Systems and Number Zones (based on Weinberg, 2001, and Buckley 1967)

Similarly Buckley (1967), creates 3 zones –of "organised simplicity" (with an example of a clock), chaotic complexity (exampling quantum mechanics where system states can only be specified statistically and stable structures may not exist), and "organised complexity"; this is where organic and socio cultural examples exist. As one tends towards the latter, communicative processes and information exchange become more complex leading to more flexible relations of the parts and more fluidity in the structure. Boisot and Mckelvey (2007) describe the vertical axis differently, using increasing variety of stimuli or input but similar zones emerge of the "ordered regime", the "complex regime", and the "chaotic regime". Organisations operate in the complex regime, whatever their desire to be ordered and whatever the pressures of chaos from above.

Weinberg (2001) identifies 3 broad properties of such systems in the organised complexity zone: "being", "behaving" and "becoming". These systems have an identifiable structure, (being), an identifiable behaviour, and due to external pressure from the environment, are able to adapt successfully (becoming). Becoming can have a number of interpretations from simple adaptation to teleological purpose, i.e. systems can seek goals (Ashby, 1969, Churchman, 1968).

This brief overview has indicated the importance of considering "systems" as being characterised by the relationship between their parts, their structure, behaviour and adaptation, and their position in a zone of organised complexity, where predictability is difficult to achieve.

2.2.3 Origins of Systems Thinking

As a topic, systems thinking originated in the late 40's, and then developed with a multitude of different perspectives and directions (Warfield and Christakis, 1987). Checkland argues that the concept of holism goes further back, existing as a long tradition in western thought which included the twin techniques of synthesis and analysis (Checkland, 1992).

The introduction of General Systems Theory (Von Bertalanffy, 1950) marked the formal beginnings of systems analysis based on an hypothesis that natural sciences shared a common study of the interaction of arrangements of elements. Von Bertalanffy was seeking to counter the two then prevailing theories current in biology: the "mechanical", which maintained that life phenomena could be reduced to physics, and "vitalism", that there is something metaphysical in life that transcends explanation. He attempted to form laws of organisation which could then be applied to other disciplines, such as medicine and psychology (Hofkirchner and Schafranek, 2011). Von Bertalanffy saw systems thinking as a new way of looking at the world, not a theory explaining elements of the existing one.

The idea was that physical, biological and social systems shared characteristics of structure and approach, such that they could be studied using a "general" systems approach. Studying the concept of the "whole", would enable communication, learning and mutual benefit across disciplines, where solutions or insights obtained in one could codified and then be applied in other disciplines (Checkland, 1992). General Systems

Theory or Thinking was intended to be both multidisciplinary and trans disciplinary, and reflected a growing awareness of similarities in thinking and analysis and benefits of cross fertilisation in many different disciplines.

Systems thinking is a search for organising principles. This was not to be achieved by mathematical or computer models and measurement but by principles using concepts such as multi-levelness, feedbacks, (negative, positive and multiple), feed forward, regulators and co-ordination (Mesarovich et al., 2004, Beer, 1965). By studying wholes as well as looking for recurring patterns of behaviour in the world and in scientific disciplines, Systems Thinking was in part a reaction to the reductionism of the prevailing scientific method.

In analytic reductionism each element can be controlled and tested for separately. For analytic reductionism to work the connections between the parts must be weak; the relationships must be linear so that parts can be summed to the whole; and optimising each part will optimise the whole. Reductionism reduces the object of its inquiry into its constituent parts, believing that they can be spilt and reassembled without any loss of knowledge or understanding (Checkland, 1999, Mesarovich et al., 2004). The 3 principles of reductionism are decomposition, addition, and if all the elemental problems are solved then the entire problem is solved (Wulun, 2007). Reductionism concentrates more on the parts than their behaviour as a whole.

2.2.4 Systems Representations

There are many ways in which systems can be portrayed ranging from straight narrative hierarchies, pictorial representations, to mathematical models.

Written narrative list hierarchies are often employed to describe systems, for example Boulding (1956), Miller (1978), Laszlo (1972). In many instances these are not necessarily "joined" or natural developmental hierarchies in the sense that higher levels emerge naturally from lower levels, but descriptions of frames to encompass parts and ultimately the whole of "reality", with the shared concept of systems being applied to an understanding of the parts and the whole.

For example Boulding proposed initially the following hierarchical description in 9 levels. In "ascending" order of "complexity" these were frameworks, clockworks, cybernetics, open systems, genetic societal, Animal, Human, social organisation, and finally transcendental (Boulding, 1956). Subsequent revision and development expanded these to 10: Mechanical, cybernetic, positive feedback, creodic (purposive), reproductive, demographic, ecological, evolutionary, human, social, and again finally transcendental (Boulding, 1985). There is a danger with hierarchical descriptions, especially the vertical / pyramidal ones, in that by often using the visual metaphor of a ladder or pyramid it could be argued that they suggest to the reader that one level produces the next and that the higher level is somehow more important than the lower levels.

Checkland (1981) proposed a non hierarchical typology in which the qualities and components of the system acted as distinguishing features, not position in a hierarchy. Checkland suggested there are 4 types of system. These are natural systems, human activity systems, designed physical systems, and designed abstract systems. Examples of each may be rivers and animals, organisations, bridges, and mathematics. Whilst it might be possible for the observer to be neutral with respect to the study of natural systems (an element of classical science), the viewpoint of the observer in influencing observation is relevant with respect to human activity systems. Even so the definition of what is a system in the natural world is a boundary judgement of what will be the unit of analysis, and thus able to be named as a system (Checkland, 1981). Checkland maintains that a human activity system does not exist as such in the real world but enables a way of thinking and debate to allow understanding and intervention. These are not models of reality, but are models relevant to debate. The notion of a human activity system may be likened to a socio technical system, in which technical activities are linked to an associated social system (Emery and Trist, 1969).

Pictorial representations and models with accompanying narrative abound. In many instances the system description is merely a graphical representation (Childe et al., 1994). Examples would include casual loop diagrams, leading to Archetypes (Senge, 1990), rich pictures (Checkland, 1981), simple diagrams (Ashby, 1969), and Viable System Models (Beer, 1979). The Viable System Model with its attendant description is a model showing the structure and relationships of all viable systems. Each viable system must contain viable systems and be part of a viable system.

2.2.5 System Qualities

In this section we shall consider some qualities of systems in particular, open and closed systems, boundaries, and emergence.

Systems can be described as open or closed. Closed systems have no exchange with the environment after any initial starting impulse; open systems exchange energy with the environment, and as a result have special qualities. Buckley (1967) brings to our attention 3 key attribute of open systems: viability, (involving learning, adaptation and purposive continuity); boundary, (the ability to be distinguished, across which energy is imported and exported to the environment); and feedback, (leading to control and purposive behaviour).

Skyttner (2001) claims that the following list of properties comprise the components of open systems: interrelationships and interdependence; holistic properties not identifiable through analysis of parts; goal seeking; inputs and outputs; transformation of inputs into outputs, even if cyclical; entropy, unless living systems are under consideration in which case they can create negentropy; regulation; hierarchy; differentiation of parts and functions; equifinality and multifinality. Similarly Katz and Khan (1966), arguing that social systems were open and not closed, suggested that an open system has the following 10 characteristics: Importation of energy; Throughput; Output; Cycles of events; Negative entropy; Information input, negative feedback and coding; Steady state and dynamic homeostasis; Differentiation and elaboration; Equifinality.

Like many other authors in this field, these authors present their list of qualities with little or no empirical evidence. Checkland (1992) criticises such lists, made from seemingly random selection of 50 or so different attributes, as having no sense of why they have been selected nor for the order in which they are presented, and which do not map on to each other. Checkland suggests that the key elements of systems thinking are the concept of a whole within an environment with which it interacts, hierarchy within the system, communication and control creating the ability to survive, and a set of processes leading to observable behaviour (Atkinson and Checkland, 1988).

The concept of boundaries is important in systems thinking. Boundaries determine the system under analysis and contain and exclude. Boundaries are drawn around the item to be analysed, to enable a focussed study (Lockett and Spear, 1980). The boundary of a system is a concept which allows the system to be identified but systems boundaries may not be the same as organisational boundaries, and the identification or naming of a boundary allows a certain set to be treated as a unit and can be used as a reference that allows study of throughputs (Kettl, 2006). The environment is also defined by the boundary, because everything else is outside, and the environment will influence the system and vice versa (Childe et al., 1994).

Open systems have an exchange with the environment across the boundary that defines them both. Weinberg (2001) likens the exchange across boundaries to ports and membranes; in a discussion on markets which he refers to as "the condensation of all transactions across the boundary into a single visible arena" (p166). In this instance the port is where transactions happen within a given set of rules, special mechanisms controlling the problems of input and output and conditions, and exchange across the rest of the boundary is limited. A membrane acts as a distributed interface: in the instance of a cell wall it can be penetrated but not universally by everything.

Boundaries are more than physical constructs as in Weinberg's port/membrane example; they do not just consist of or contain physical "stuff". Kettl (2006) suggests the following as boundaries: mission, resources, responsibility, capacity and accountability. Boundaries are more than just a geographic metaphor and may progress from the natural to the conceptual. For example, Miller (1990) in defining 8 levels of systems, gives a boundary example for each thus: cell – outer membrane; organ – outer layer; organism – skin; group – rules; organisation – building walls; community - police; society/state – customs service; supra-national – security council. Boundaries may be dynamic. They determine what is "in view" and this may change as activity "sweeps in" more of the client issues, areas of concern and purposes (Churchman, 1979).

A key feature of systems thinking is the appreciation of multi – levelness and the emergence of different sorts of behaviour at different levels. "Systemists often state that to understand the specific systemic qualities and behaviour on a certain level it is necessary to study the levels above and below the chosen level" (Skyttner, 2001, p51). This does not indicate change in system type, as set out in descriptive hierarchies, or a switch between elements of a taxonomy, but an observer change of perspective or viewpoint. Checkland refers to this as system, sub-system and wider system (Checkland, 1999).

It is claimed that the properties of system emerge from the interactions between the elements. This is often referred to as the properties of the system are greater than the sum of its parts but could better be characterised as the properties of the system being different to/from the parts, as new properties arise out of combinations of lower level parts (Kirk, 1995). Emergent phenomena are not explainable or predictable from the behaviour or parts of the lower (Goldstein, 1999).

The concept of a system may be depicted in the following diagram Figure 2.2 in which a boundary is drawn around the elements of a set which enables them to be distinguished from the immediate and wider environment. The boundary allows for inputs and outputs to cross the boundary. Within the system there is an element of control, and the system contains subsystems through which inputs are transformed to outputs.

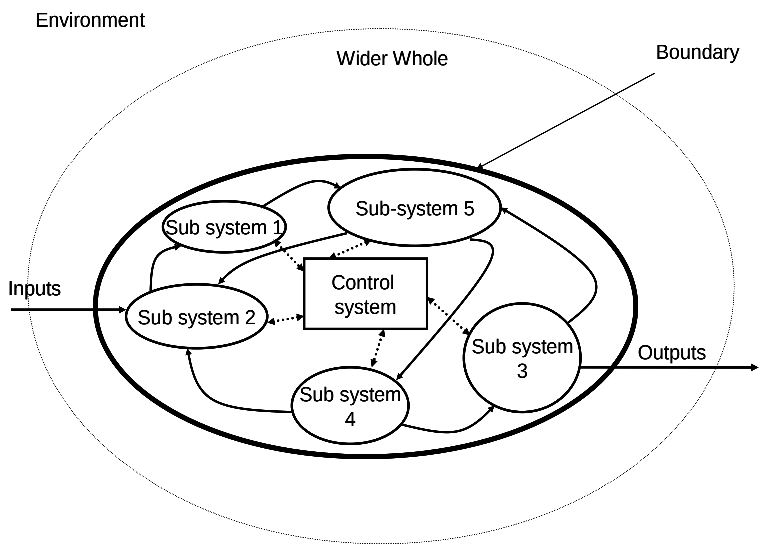

Figure 2.2 Features of a System (based on Checkland, 1981)

2.2.6 Organisations as systems

An organisation can be considered to possess systemic qualities for an organisation is made up of a set of things; there are strong relationships between the parts, which in general are stronger than the relationships with the environment. It imports energy from the environment; it transforms inputs into outputs. It has mechanisms of control.

It may be said to have a purpose, be it profit maximisation, education or healthcare or others. It has a clear boundary, often legally defined between it and the environment. It is capable of continued existence, development and growth and adaption. It may appear differently to different observers carrying different viewpoints (Childe et al., 1994).

Advantages exist in viewing organisations as systems. An organisation will behave as a system whether it is being managed as one or not, and the organisation will develop behaviours that may be both unexpected and difficult to change, with interdependencies and constraining influences (Rummler and Brache, 1995). Relationships and elements tend to be tightly coupled in causal chains with time delays, non linear feedback and amplification and leading to counterintuitive behaviour (Buckley, 1967, Forrester, 1994).

Some systems thinkers have explicitly treated organisations as systems. The most notable example is Beer, with his proposed “ideal type” of organisation represented by the viable systems model (Beer, 1979). To be viable any organisation must consist of 5 separate but conjoined systems. System 1 is the principle operation and transformation of the organisation; System 2 are the information flows by which the organisation is controlled; System 3 is the direct control and co-ordination activity; System 4 is the intelligence function by which the organisation looks outward to its environment, and System 5 is the overall policy making activity. Each subsystem must remain viable for the whole organisation to remain viable. Each viable system must contain and be contained within a viable systems. A representation is set out in Figure 2.3 below.

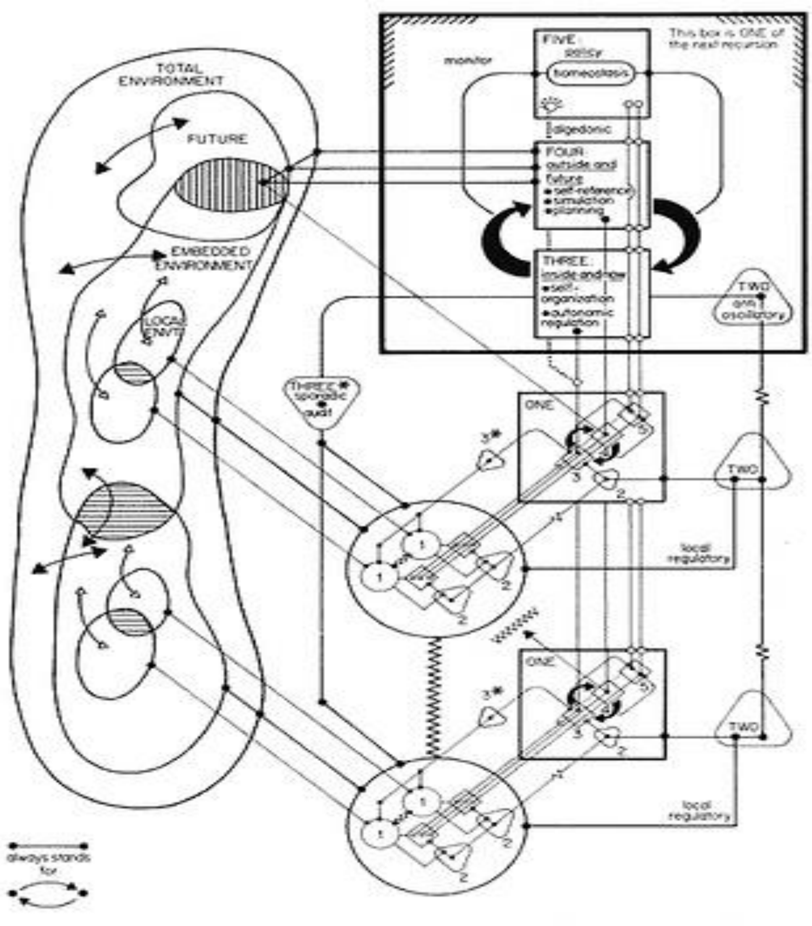

Figure 2.3 The viable system model developed by Beer, (1984)

Senge (1990), views organisations as systems in systems dynamics terms with strong feedback loops and non-linearity, leading to his proposal that organisations exhibit recurring patterns of archetypal activity. Emery and Trist (1969) suggest that organisations are socio technical systems, with a social and a non-social element. Miller and Rice (1967) developed the concept of a primary task which is the dominant process of any organisation. They viewed organisations as "systems of activity" with the focus on the throughput and a series of transformations.

The organisation contains within it a number of functions which include the operation. These may include directive functions such as management, planning, marketing; more strongly operational areas such as sales and IT; and supportive functions such as finance and premises. If the operation is deemed to be the system under consideration, then the next level "up" will be the organisation; populating the next level down will be processes which form the transformation activity.

This idea of an organisation as system may be depicted in the following diagram, Figure 2.4, based on a framework developed by Checkland, Warmington and Wilson (1983) which shows an organisation as a system. In the diagram, "T" represents the primary task which transforms inputs into outputs, "P", the planning system, " S", the support system, "C" represents the enterprise wide control system and L, a linkage system to the external world which would include such activities as marketing, R&D etc. Each of the sub-systems naturally has its own local control system, depicted inside a smaller circle, also labeled "C".

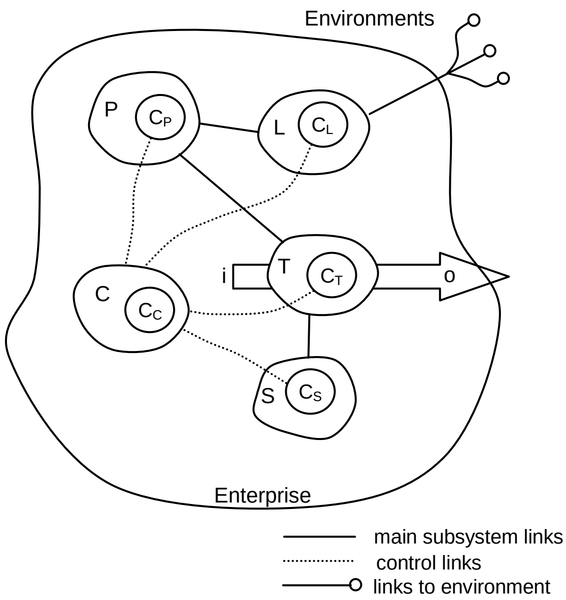

Figure 2.4 Enterprise model (adapted from Checkland, et al., 1983)

In this section we have briefly covered the key tenets of systems thinking. The key common elements of systems approaches are often described as the paired concepts of information / control, and emergence / hierarchy (Atkinson and Checkland, 1988, Checkland, 1981). But this summary analysis risks obscuring equally important concepts of boundary, relationships of parts, and viewpoint. We have seen that boundaries are arbitrary and the observer has an explicit role in setting this boundary, and an implicit role in assigning a purpose to the "system" thus enclosed (Weinberg, 2001).

We have seen that there are advantages in considering organisations as systems and we now turn to consider the application of systems thinking to a part of the organisation studied within the domain of OM.

2.3 Operations Management

2.3.1 Introduction

The purpose of this section is to provide a brief overview of the broad areas in OM in respect of its applicable domain, the approaches employed, the theories espoused, developments within the discipline, the types of challenges faced, and the role played by systems thinking.

2.3.2 Operations Management

OM is a practical, applied and pragmatic discipline. It aims to fulfil the "need to offer answers to the concrete problems that emerge within both industry and services" (Filippini, 1997, p660). It is "principally defined by the pragmatic challenges of immediacy" (Slack et al., 2004b, p372). The broad domain of OM as a scientific and academic discipline is given as: the management of performance, entailing strategy, design of processes products technology and organisation, planning and control of capacity inventory, supply chains and the enterprise, and improvement of operations and risk (Slack et al., 2004a). These "textbook" topics are reflected in the literature.

Kouvelis, Chambers, & Wang (2006) reviewing articles within a leading OM journal between 1992 to 2006 found the following key topics:

- supply chain management and design,
- uncertainty and the bullwhip effect,
- contracts and supply chain co-ordination,
- capacity and sourcing decisions,
- applications and practice,
- teaching supply chain management.

A similar review of empirical articles, Gupta, Verma, & Victorino (2006), showed that the top 6 research concerns, accounting for roughly 75% of the published papers, were:

- strategy,
- quality management,
- supply chain management,
- environmental issues,
- product and service design,
- process design / analysis

It is claimed that because of its practical nature OM lacks a unifying theory. Slack, et al. (2004) point out that unlike other academic management topics such as marketing and finance, OM lacks a clear connection to a "base theoretical discipline". "OM is a curious amalgam of very different academic inputs (for example *systems theory*), and practical fields of application (for example production engineering)" (Slack et al., 2004b, p372, my italics). This lack of underlying theory has been noted also by Schmenner & Swink (1998).

2.3.3 The development of Operations Management

The origins of OM can be placed in the early C16th when an early text on mining and metallurgy provided the basis for a start of both OM (using familiar empirical and data based approaches) but also geology (Sprague, 2007). Sprague identifies the beginning of the C20th as the origins of a proper discipline recognisable as OM, as divergence from its earlier engineering base began. The scientific management approach of Taylor "one best way to do each job" (p223) accelerated the focus away from machinery towards the organisation of workers and management. Sprague identifies 5 phases in the development of OM: scientific management (Taylor); factory management; (1910 onwards); Industrial Management (1930's); Production management (from 1945); and currently OM. Throughout all these developments two themes emerge for Sprague: "facts as the basis for action" and "systems and their peculiarities" (ibid. p223).

Filippini (1997) suggests that early studies in OM were descriptive. These were replaced by mathematical techniques such as simulation and queuing theory, with the aim of OM being productivity maximisation under an assumption of a closed production unit. Later studies in the 1960's and 1970's were characterised by the growth of influences of systems thinking techniques such as Management Science / Operations Research. However, this early expectation that the developing "scientific method" was capable of being generalisable to the whole of OM, was replaced by research into abstract techniques rather than empirical studies of practical application (Filippini, 1997). During the 1970's, Chase (1980) found the large majority (88%) of research articles were "micro" (relating to isolated or single issues) rather than macro (e.g. strategy and relationships), and that 76% dealt with technical issues (e.g. scheduling, inventory control, and plant layout).

However, by the 1980's the topics being covered began to be broader and could be grouped into operations policy, operations control, service operations and productivity and technology, seen as representing a broadening of the role of OM within the organisation. This trend continues although research in the late nineties was still restricted to narrow topics such as inventory control and scheduling (Filippini, 1997).

Adopting a slightly different, time based rather than strictly topic based approach to the development of OM, Bayraktar, et al. (2007) identify 4 time categories for analysis; being pre 1970, 1970-1990's ("the past"), early 1990's mid 2000's ("the present") and "the future". These are compared across the 6 themes of "focus", "nature and effects of the environment", " organisational structure", "concepts and tools employed", "philosophies and approaches", and "research themes".

Their analysis is set out in Table 2.1 below.

Time	Theme					
	Focus	Environment	Structure	Concepts /tools	Philosophies / approaches	Research themes
Pre 1970	Cost reduction / labour productivity Industrial management / Factory management	Mass production economies of scale industrialisation. shareholder as major stakeholder	functional	ROP		Scientific management; simulation; modelling; LP; heuristics
1970 – mid 1990s "the past"	Quality	Computers; Stand alone solutions Japanese production methods. Customer as key stakeholder	Flatter organisation with increased employee involvement	MRP Kanban Flexible Manufact uring systems	Push JIT TQM	Inventory control; operations policy and strategy; inventory control; MRP; JIT
Early 1990s to mid 2000's "the present"	Cost / quality delivery time/ flexibility Mass Customisation	Flexibility throughout the organisation Customers role has increased in importance and joined by society and community as stakeholders	Increased internal integration using cross functional teams OM moves towards centre of organisation	ERP / CRM / SCM / SRM / KM	Lean Agile Mass Customisation	Product life cycle management Service operations Strategy and operations integration
The "future"	Information	Rapid digital advances / globalisation / virtualisation	Focus on core competence and networks			The impact of Globalisation, virtualisation, sustainability, and networks on traditional OM themes

Table 2.1 Developments in Operations Management (based on Bayraktar, et al., 2007)

This progression suggested by the table above is of an ever expanding domain of OM both within the organisation, but also as part of an evolving environment. The subject has expanded from work organisation in the factory, with the appropriate research concentration on mathematical techniques such as optimisation, to an increasing emphasis on strategy, wider groups of stakeholders to include customers and society, strategy, and relationships within internal and external networks.

More recent but more limited in scope studies generally concur with the conclusions of Bayraktar (2007) and Filippini (1997). The locus of OM research continues to move away from micro issues in favour of more strategic and integrated topics (Pilkington and Meredith, 2009). Current research in OM reflects the concerns of strategy, performance improvements, relationships, and service industries (Taylor and Taylor, 2009).

McCarthy et al., (2012) argue that in a "post lean" age the combined challenges of ICT, globalisation and the economic recession in the wake of the collapse of Lehman Brothers, continue to impact OM research which in response should become more qualitative, empirical and more relevant to practice. Empirical research becomes the "dominant paradigm" (Singhal et al., 2008) with research findings needing to lead to actionable solutions, or provide new perspectives and insights about the situations in which practitioners find themselves (de Margerie and Jiang, 2010).

Craighead and Meredith (2008) find that OM research continues to move away from being heavily dependent on rationalistic axiomatic and artificial analyses towards increasingly interpretive approaches using empirical observations typically involving case studies. Management practices continue to evolve and be replaced by new tools (Kuula et al., 2011). OM research should be more aimed towards operating systems that are less well defined and potentially possessing multiple objectives (Singhal and Singhal, 2012). Sousa and Voss (2008) argue that there is increasing evidence within OM that best practices for operations management and improvement are contingent on context.

There is clear evidence of the influence of systems thinking on both techniques and topics. Early techniques such as Management Science / Operations Research have a clear systemic underpinning. Checkland (1983) in his review of Operations Research traces its historical development and the 'intellectual breakthrough' that occurred as result of the basic methodology of problem formulation, experimentation for best solution and implementation. He then considers the application of this approach in specific situations such as routing, queuing, and inventory that are frequently found in operational management. He goes on to consider the development of Systems Engineering and Systems Analysis and concludes that all three approaches are based on the same intellectual position; a search for efficient ways of meeting desirable objectives in real world problems.

More recently, Fowler (1999) places the language of systems thinking right at the centre of modern OM. He identifies the basic operations transformation model, which is frequently the first conceptual framework in core textbooks e.g. Slack, et al. (2004a), as 'intrinsically systems oriented' (p183). In the field of supply chain management Croom, et al. (2000) place systems thinking first amongst the antecedent disciplines underpinning theoretical developments in that field. Systems dynamics in particular has a strong tradition of application in OM and Supply Chain Management, see for example the importance of systems thinking in the development of the Forrester effect (Forrester, 1961), and the review of systems dynamics in OM provided by Grossler, Thun and Milling (2008).

Other examples in more recent OM debates include Mason-Jones and Towill (1999) who take a systems approach to the design of agile supply chains. Sprague (2007) in her keynote paper on the relationship of OM and Systems notes that the application of systems thinking to operational issues is increasingly prevalent in OM, and considers this is a long term trend. We may conclude that explicitly, or more often implicitly, most OM research has, *de facto* taken a systems approach. The increasing emphasis of OM research on services and servitisation, and network relationships inherent in globalisation and virtualisation are themes which are likely to extend further the influence of systems thinking in OM.

2.4 Systems Approaches

2.4.1 Introduction

There has been significant growth and development in the application of systems thinking, using "Systems Approaches", at least in the UK, reflected in the increase in the number of separately identifiable methodologies in the last 6 decades. The position in the US is one of less development in range but a deepening of technique (Paucar-Caceres, 2003).

A number of ways of structuring systems approaches exist. We shall review a selection of these, beginning with Muller-Merbach (1994), who presents an analysis based broadly on disciplines, moving on to Paucar-Caceres (2003), who provides a historical developmental time line, and concluding with Jackson's System of System Methodologies (Jackson and Keys, 1984, Jackson, 2006).

2.4.2 System of System Approaches

We start by reviewing the work of Muller-Merbach (1994), who in his "System of System Approaches" defined the systems approach as focussing on "the consideration of wholes and of their relations to parts." (p16). He develops a hierarchy (with an admittedly "artificial typology") which distinguishes systematic from systemic, and is broadly discipline based. Systematic approaches are split into 3 – "science", "engineering and management sciences" and "humanities and social sciences". Treating these more traditional approaches as systematic, Muller-Merbach considers that only the discipline of "eastern philosophy" is truly systemic and holistic, given its appreciation of the indivisibility of the whole. He distinguishes 4 approaches which he labels as "Introspection", "Construction", "Extraspection", and "Contemplation", based initially on their "principle", being respectively "Analysis", "Creation", "Synthesis" and "Holism". These are set out in Table 2.2 below.

Muller-Merbach identifies differences between the approaches based on a wide range of themes, e.g. orientation, the role of the researcher and approach to social organisations and interdisciplinarity.

System Approaches	Introspection	Construction	Extraspection	Contemplation
Principle	Analysis	Creation	Synthesis	Holism
Prototypical of:	Science	Engineering and Management Sciences	Humanities/social sciences	Eastern Philosophy
Method	Reduction	Design/construction	Integration	Mediation
Orientation (*understanding of)*	Causality	Pragmatism (getting things done)	Finality	Internalisation
"Enlightenment" based on / reduced to:	Knowledge	Acquaintance	Insight	Understanding
Knowledge	Can be exchanged interpersonally			Individual
Subjectivity	Rational Distance	Responsibility	Individual Relation	Identification
Knowledge gained from	Understanding the final non divisible elements	Insights into both internal causal structure and into external final environment providing acquaintance with functionality	Comprehension of the whole/ultimate system	Fully understanding and identifying with entities as inseparable wholes
Role of Researcher	Objective neutrality	To carry full responsibility for design and hence object, but with critical distance	Individual relation to object and its purpose	Becoming (immersed in) the object; distanceless neutrality (unattachment)
System Characteristics	Things consist of parts which themselves have parts/subsystems	All things both consist of parts and are part of higher systems	Things are parts of systems which themselves are parts of higher systems	Things are indivisible wholes and are destroyed by division
Key Activity	Division	Divide into parts and insert into purposeful contexts	Insert into purposeful) context	Identification
Approach to interdisciplinarity	Approach splits total task into sub tasks which have to be solved by specialists; knowledge based on total of single contributions	Design process requires different specialisms	Integration process requires combination of many different insights from many disciplines	A personal commitment to using full cognitive ability. Systems approach stands above and beyond single disciplines and provides trans disciplinary understanding
Approach to social organisations	A system is understood by reducing the system under study to its parts	A system is constructed as a combination of parts and as a part of higher systems (elements and environment)	Move outwards from the system under study to surrounding systems of *higher comprehension*	Systemic wholes

Table 2.2 System of System Approaches (adapted from Muller-Merbach, 1994)

Each type has a different approach to how they characterise systems and social organisations. The "scientist" describes "things" as consisting of parts which in turn have subsystems. "Engineers" see that all things consist of parts, which in turn are part of larger, higher systems. Social scientists have a similar view but for them "things" are but parts of systems which are part of larger systems. "Eastern philosophers" see things as indivisible wholes which division destroys.

Each approach tends to be used singly rather than together. "[T]he vast literature of systems and systems approaches is dominated by methodological singularism in the sense of applying a single type of systems approach" (p25). While some authors deny other approaches exist "other authors refer to other approaches but claim superiority for their own" (p25). Finally Muller-Merbach argues the need for a pluralistic method of understanding and using all the approaches, given that each has its own advantages, strengths and attractions, a view supported by Jackson (2006).

2.4.3 Historical Development of System Methodologies

The second classification to be considered is proposed by Paucar-Caceres (2003). This is taxonomy of actual approaches, rather than a typology based more on abstract concepts. Paucar-Caceres presents a timeline of developments of "management science methodologies" within what he describes as the English language / US-UK "systems movement". The changes in the depiction according to Paucar-Caceres are driven by theoretical developments in both systems thinking and other disciplines such as psychology and sociology. The timeline depicts 4 distinguishable time based categories of systems approach using the following "paradigms" as labels: "optimisation" (1950 – 1970); "learning", (1970 – 1980); "critical systems" (1980 – 1990); and ""multi methodology / critical pluralism" (1990 onwards).

Paucar-Caceres' depiction is more practical and less theoretical than Muller-Merbach's. He places named approaches and techniques e.g. Operations Research within particular time periods, thus giving a shape to his categorisation and enabling him to place the names of the key researcher or originator of the approach in context. In general Paucar-Caceres puts the theoretical developments as occurring decades or more prior to the full development of the associated method. He sees the associated development of theory and enabling techniques as allowing the systems approaches to mature and change.

A full analysis is set out in Table 2.3 below.

Paradigm	Typified as	Methods / methodologies	Theoretical Developments
"Optimisation" 1950 - 1970	Hard Thinking: Problem solving methods and techniques	Operations Research Operational Research Systems Engineering Systems Analysis / RAND Systems Engineering Systems Dynamics	
"Learning" 1970 - 1980	Soft Thinking: Situation Improving Methodologies	Organisational Cybernetics / VSM Soft systems methodology Cognitive Mapping / SODA	General Systems Theory Cybernetics Management Cybernetics Appreciative Systems The systems approach Social Systems Design Socio Technical systems Personal Constructs Psychology
"Critical Systems" 1980-1990	Intervention Empowering methodologies	Total Systems Intervention	Critical systems thinking Systems of Systems Methodologies
"Multi-paradigm" 1990 -	Multi methodology Critical pluralism	Multi-paradigm Multi - methodology Critical / Pluralism Systems Practice	

Table 2.3 The historical development of systems methodologies (adapted from Paucar Caceres, 2003)

The time lines division may not however be that arbitrary, given that he suggests that there are very few strong influences between or across his 4 paradigms in the early stages of development of systems approaches. For example Systems Engineering is suggested as a weak influence on Soft Systems Methodology, (SSM), developed by Checkland. This is partly surprising given that Checkland and Jenkins worked together at Lancaster and SSM developed out of a growing realisation at Lancaster that optimisation techniques were proving unsuitable for use in understanding and improving human activity systems, Checkland (1981). It is less surprising if considering the significant divide between "hard" systems approaches (which take a positivist approach) and soft systems which adopt an interpretivist viewpoint. SSM is itself seen by Paucar-Caceres as a weak influence on the development of critical systems thinking by Mingers (1980) and Ulrich (1987). There are much stronger influences identified by Paucar-Caceres between the critical systems paradigm and pluralistic approaches but this is to be expected given the predominance identified of Flood and Jackson (1991), and Mingers (1997) in developing the two paradigms and multiparadigmatic use of methodologies. Paucar-Caceres identifies an apparent lack of theoretical input and development in the U.S. on systems approaches, other than the one named author, Churchman, whom Paucar-Caceres claims to have influenced Checkland.

It is noteworthy that after the optimisation phase, each approach is identified with a lead author / researcher, and the way in which Paucar-Caceres' "paradigms" change from a focus on the external (optimisation), through a focus on the internal (critical) and finally to a blended approach in which more than one methodology can be employed by the same researcher, reflecting Muller-Merbach's call for an approach in which more than one paradigm is employed.

Neither Muller-Merbach nor Paucar-Caceres include the problem context in their framings of system approaches, and thus are not dependent on a particular problem context or the nature (real or perceived) of the problem changing over time. We will now consider a depiction that in part attributes the changing nature of the problem as the driver behind the development of system approaches.

2.4.4 System of System Methodologies

Jackson (2003), in his System of System Methodologies (SOSM) explicitly brings the "problem" into his framework. Having reviewed a framework based largely on discipline, and one based on time, the SOSM places the development of systems thinking and systems approaches in the context of problems exhibiting greater complexity, through changing their nature and the increasing diversity of the participants. This increasing complexity has two dimensions, the problem being considered, and the number and type of viewpoints the participants have about the problem. Using "ideal types" Jackson initially sets up a dual typology with problems as being "simple/mechanical" or "complex/systemic", and viewpoints as being "unitary" or "plural" (Jackson and Keys, 1984). Further developments around systems approaches, especially critical and post modern approaches, leads to the need for further classification of participants labelled as "coercive" (Jackson, 2006). Based on the literature and his analysis, Jackson sets out his interpretation of systems approaches in these two dimensions, having one axis referring to the qualities of the problem, or problem context, and the other axis referring to the participants. "Problems" move down their axis as they become larger and more systemic, participants move along their axis as their viewpoints and interests increase and move apart. The overall effect is that "problem contexts become more difficult to manage as they exhibit greater complexity, change and diversity" (Jackson, 2003, p18).

This analysis provides Jackson with a 6 box framework in which systems approaches can be placed according to their positioning with respect to the problem or system and its participants (Jackson, 2006). An example of the framework is set out below in Figure 2.5.

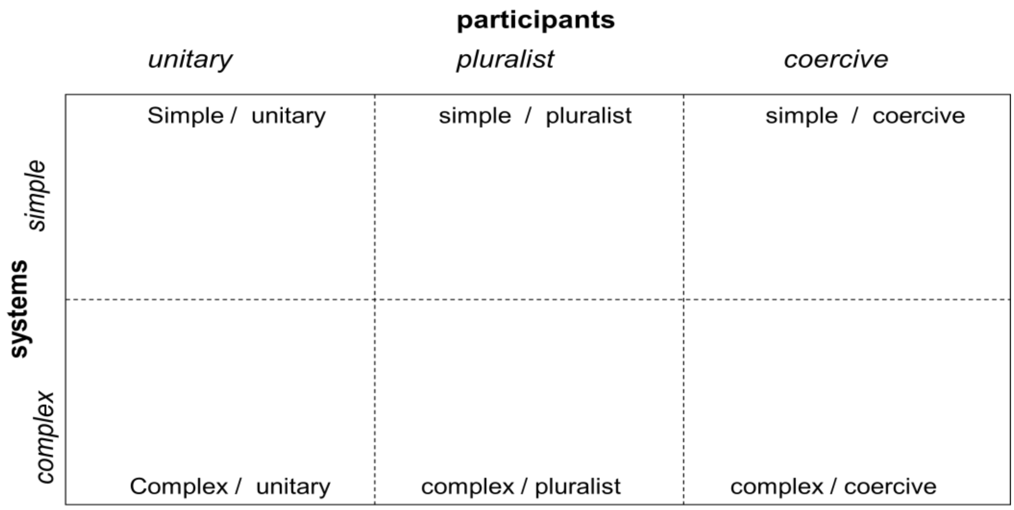

Figure 2.5 Framework to show development of systems thinking (based on Jackson, 2003; 2006)

This framework may then be populated in a variety of ways, showing how systems approaches are related to the nature of the problem and the values of the participants. For example Figure 2.6 below shows the positioning of a number of systems approaches within the framework. Jackson (2006) provides a development path from the original application of systems thinking in OR /MS towards Systems Dynamics, Organisational Cybernetics and Complexity Theory within the unitary frame, as attempts to uncover relationships underlying surface events; and horizontally to Soft Systems Thinking as subjectivity rather than objectivity becomes essential to the approach. This subjectivity develops further as participant's viewpoints and interest diverge further, and relationships become unequal leading to emancipatory approaches being required. The positioning of Post Modern approaches reflects its view of the inadequacy of any approach to deal with the degree of complexity seen within problem contexts (Jackson, 2006).

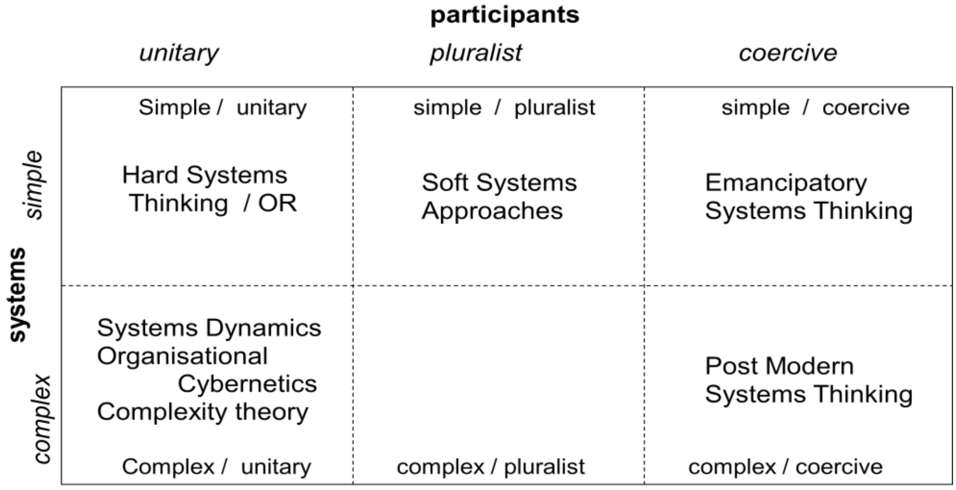

Figure 2.6 Positioning of System Approaches within the SOSM frame (based on Jackson, 2003; 2006)

It is possible to use the framework to show the actual techniques or the researchers linked to these techniques within each approach. This is set out in Figure 2.7 below.

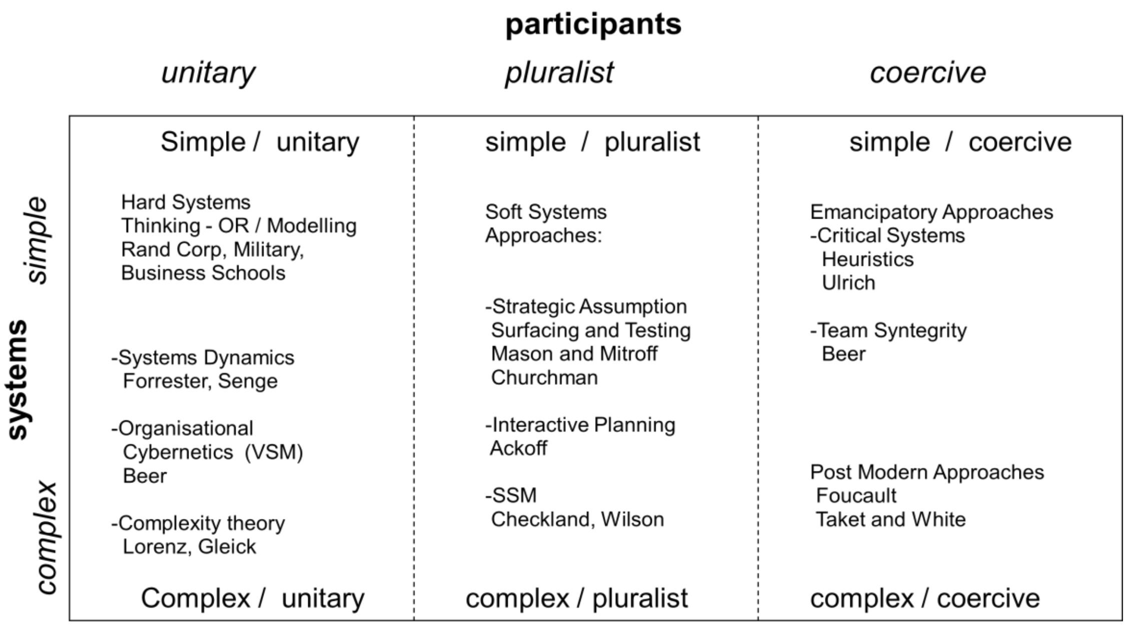

Figure 2.7 Positioning of techniques and researchers within the SOSM frame (based on Jackson 2003; 2006)

Jackson continues by refining the ideal type model by overlaying it with a “paradigmatic” approach which reduces the frame to the following 4 paradigms, each with their own purpose. The 4 chosen label/paradigms are Functionalist (improving goal seeking and viability); Interpretive (exploring purpose): Emancipatory (ensuring fairness); and Post Modern (promoting diversity). Metaphors are also provided to broaden the analysis (Jackson, 2006, Jackson, 2003). A description is set out in below.

Paradigm	FUNCTIONALIST	INTREPRETIVE	EMANCIPATORY	POST MODERN
Purpose	Improving Goal Seeking and Viability	Exploring Purpose	Ensuring Fairness	Promoting Diversity
	prediction and control so that better regulation can be obtained	oriented towards achieving greater mutual understanding between different interested parties to better regulation of the enterprises can be obtained	oriented towards eliminating sources of power and domination that illegitimately oppresses individuals and groups	stands opposed to modernist paradigms, subverting and ridiculing their attempts to impose order on a world that is too complex, coercive and diverse
Examples	Hard Systems (e.g. OR, modelling) Systems Dynamics Organisation Cybernetics (VSM) Complexity Theory	Strategic Assumption Surfacing and Testing Interactive Planning SSM	Critical Systems Heuristics Team Syntegrity	Panda
Why	failure of reductionism to cope with problem situations exhibiting increased complexity and turbulence	failure of the Functionalist paradigm to pay attention to the existence of differing values, beliefs, philosophies and interests; agreement on purpose can no longer be taken for granted	failure of the functionalist / interpretive paradigms to ensure proper participation and to address the disadvantages faced by some groups	other paradigms seen as suppressing difference and diversity
Emphasises	efficient use of resources in the achievement of goals and efficacious design of organisations so that adaptability is ensured in the face of complexity and environmental change	effective problem resolution based on the classification of purpose and the formulation of elegant solutions	empowerment of those discriminated against lets them take full advantage of their rights	the exceptional makes a space for suppressed voices unleash creativity and fun
SOSM position	differ in how they deal with problem complexity	differ in how they deal with (nature and context) pluralism along the horizontal axis	they see conflict and coercion as endemic in organisations	problem contexts lie at the extremes of both axes,

Table 2.4 Systems Approaches analysed by paradigm (based on Jackson 2003; 2006)

A key driver of the development of the number of different systems approaches is seen by Jackson as the changing nature of the "problem" and the needs of the participants. He describes the growth of functionalist systems technique as being due to the inability of a traditional scientific reductionist approach to deal adequately with or successfully maintain efficiency with problems growing in "complexity and turbulence". Interpretive techniques become prevalent as researchers realised the need to accommodate differing views of participants as to what the purpose of the system is, hence meaning that attaining agreement through discourse became a necessary part of the approach and its methodology. Which participants should be included in the discourse, to both enrich it and deal with disadvantaged groups, was a key step in moving beyond the interpretive approach into the emancipatory. Finally the post modern approach is included by Jackson although he sees it as fundamentally different and "opposed" to the 3 modernist paradigms, in that any attempt to achieve or improve order is impossible given their perceived nature of reality. The purpose of a postmodern technique is oriented towards achieving personal creativity and learning (Jackson 2006).

Jackson ascribes the following question to his 3 SOSM columns: Where is the problem? What is the problem? Who is the problem? (Jackson 2003).

2.5 Concluding remarks

Having reviewed the development of both system approaches and Operations Management we may draw the conclusion that the main influence of systems thinking and systems based approaches on OM occurred in the period up to the mid 70's with the increasing application of OR techniques to optimising plant performance. This was the period characterised by Paucar-Caceres as "optimisation", Jackson as functionalist ("improving goal seeking and viability"), and a philosophy labelled by Muller-Merbach as "functionality", "pragmatism" and "getting things done". The development of Management Science offered rational solutions to problems once identified.

According to Jackson, the failure of these functionalist techniques when faced with problems exhibiting more complexity, or more people with multiple rather than unitary viewpoints, led to the growth of systems approaches based on more interpretive and emancipatory paradigms using techniques seeking agreement, understanding and personal development. Though these approaches are particularly appropriate for other parts of the organisation (e.g. strategy, planning and design) they are less suited to the more narrow confines of OM. Surprisingly for a coming together of disciplines, that is OM, based on applied techniques and empiricism, and the other, systems thinking, based on open systems relationships and boundaries, the acceptance and use of OR techniques led to a concentration on abstract mathematical techniques, micro research, and theoretical rather than empirical studies (Chase, 1980, Filippini, 1997).

Systems thinking can be defined as the "use of systems ideas when facing a problematic situation" (Paucar-Caceres, 2003, p65), and we will now turn to a consideration of problem types.

CHAPTER 3

WICKED PROBLEMS

3.1 Introduction

Chapter 2 reviewed the origins and the key tenets of systems thinking and the application of systems thinking to Operations Management. It also reviewed the development of systems approaches in response to the growing complexity of problems, and their increasingly social nature, and saw the development from functional methods to more inclusive ones.

In this chapter we examine the nature of problems and the characteristics of wicked problems, introduced by Rittel and Webber (1973), by exploring the concepts, and drawing out their underlying themes. We also consider the empirical research on wicked problems in an operational context; this enables us to frame our research objective and questions.

This chapter is set out in the following sections:

3.2 The nature of problems

3.3 Wicked problems

3.4 Empirical work on wicked problems

3.5 Research Objectives

3.6 Concluding Remarks

3.2 The nature of problems

3.2.1 Definition of problems

We begin this chapter by clarifying our understanding of the problem concept. Dictionary definitions[1] suggest there are two broad types – "scientific / mathematical" and "unwelcome situations". The former have clear solutions, operations and rules, the latter need to be "dealt with", and have less clear rules. For example, in physics or mathematics, a problem is a question which needs an answer or is an inquiry starting from given conditions to investigate or demonstrate a fact, result, or law. There is an element also of problems occurring in games, for example, a problem in chess is an arrangement of pieces in which the solver has to achieve a specified result. The natural language definition defines a problem as a matter, situation, person or thing, regarded as unwelcome or harmful and needing to be dealt with and solved or overcome, or a thing that is difficult to achieve.

A "problem" indicates that an undesirable issue needs to be dealt with but the necessary actions are uncertain and ill-defined; although some problems are straightforward, being "nice", "rational", "easily quantifiable", others are less so (Eden et al., 1983).

Problems may be described in a number of ways. Evans (1989) provides 4 from the literature: "a felt difficulty"; "a gap or obstacle to be circumvented", "dissatisfaction with a purposeful state" and "a perception of a variance or gap between the present and some desired state of affairs" (p501). The solution to the problem state is characterised by unclear choices of action which can materially impact the future. The problem space includes someone willing to close the gap (Schwenk and Thomas, 1983).

3.2.2 Classification of problems

The problem then needs to be classified in some manner. Traditionally this work of classification has been seen as belonging to the set of "binary" typologies of problems, as evidenced by "tame/wicked" (Rittel and Webber, 1973), "problems/messes" (Ackoff, 1979), "soft /hard", (Checkland, 1978), "technical/practical" (Ravetz, 1971), "high ground/swamp" (Schon, 1987), "well-structured/ill-structured" (Simon, 1973). The dividing qualities generally are based on difficulty in finding a solution, with for

[1] Oxford English Dictionary on line; www.oed.com

example a “hard” problem having a clear objective function and clear method generating and evaluating solutions, but soft or unstructured problems lacking such a means-end method possibility (Checkland, 1981). Such typologies suffer from two failings. The first is an inevitable lack of granularity: everything is “either/or”, which leads to inevitable concerns over “degrees” and choosing appropriate interventions. The second is disparities in the sizes of the relative populations of each type, with the boundary being difficult to define and with most problems ending up in the “harder” category (Simon, 1973).

As we have seen in the previous chapter Jackson (2003), in describing problems as becoming more complex and difficult to solve, introduces a two dimensional “typology”, with the problem being either simple or complex, and the other dimension being the nature of the environment in which the players consider they are acting. Simon further proposes 3 problem “types” depending on the amount of information available on current and future states, notably well, semi, and ill structured, the key difference being the amount of information available (Simon, 1977).

Kesavan, Mascarenhas, Kesavan, & Crick (2009) extend the analysis on problems to introduce greater distinctions and grade problems in essence by their “degree” of wickedness, on a progressive scale. Problem types go from simple, complex, through Simon’s ill structured, “characterised by lack of agreement on problem statement, solution paths and solutions that are plagued with a high degree of uncertainty”, but these may not “meet all the criteria of a wicked problem” (p65) and lastly, wicked. So they propose that “tame” has two classes, simple and complex, as in essence does “un tame” i.e. ill structured and wicked, using a scale of uncertainty. This approach is mirrored by Becker (2007), who suggests that wicked problems have qualities that are in addition to ill-structured problems, the most significant of which are the social context, which adds many different potential viewpoints, and the tendency of the nature of the problem to “drift” and change while it is being “solved”. Becker suggests that the qualities portray two ends of a continuum, tame and wicked, but points out that tame does not imply easy.

Head and Alford (2008) extending work by Heifetz (1994), analyse problems into 3 types based on the information held about the problem and its definition and solution, and whose responsibility it might be deemed to be, and whether the resulting work would be technical and formulaic, or needs to be more flexible and adaptive. A problem whose solution is described as exploratory is one in which the relationship between cause and effect is not clear). This provides a description of three types of problem 1, 2 and 3 set out in Table 3.1 below. If a type 3 problem contains multiple stakeholders whose interests or values conflict, these are described as “very wicked”.

	Problem definition	Solution	Locus of responsibility	Kind of Work	Tame / Wicked
Type 1	Clear	Clear	Manager / expert	Technical	“Tame”
Type 2	Clear	Exploratory	Manager/ expert and stakeholders	Either	Either
Type 3	Exploratory	Exploratory	Stakeholders / expert	Adaptive	“Wicked”

Table 3.1 Problem types (based on Head and Alford, 2008)

Muller-Merbach (2011) finds 5 types of distinguishable problem prevalent within the literature. These are:

1. raw problems (or “Ackoff’s messes” (Ackoff, 1973) which are not structured or organised;
2. a verbally structured problem, interpreting the raw problem based upon data, experience and professional expertise;
3. a mathematical model not based on reality but idealised standardisations; and having little overlap with problems 1 and 2;
4. models of reality combining 1, 2, and 3 and ready for computation;
5. textbook problems which may be simplified versions of 3.

Muller-Merbach clearly sees the literature as grounded in the functionalist paradigm, in that the role of the expert is apparent in the type 2 problem as able to formulate clear solutions from a “mess”. These are “idealised” problems, in which analysis, development and relevance is built around development of the model rather than application to reality which moves from developing a solution to developing a model (Bertrand and Fransoo, 2009). OM Research, according to Bertrand and Fransoo, tends to concentrate on type 3 problems as marginal gains can be made and assessed with relevance to earlier work but they observe that this approach fails to address operational problems found in reality.

It is these complex operational problems that this research is concerned with. To investigate these more fully we have used the framework of "wicked problems" and it is this framework that we will now consider in greater detail.

3.3 Wicked problems

3.3.1 Introduction

In this section we will examine in detail the nature of "wicked problems". "Wicked Problems" is a term for a class of problems that are claimed to be essentially insoluble, but are sufficiently practical, crucial and important, that they demand solving. Examples given of wicked problems tend to be societal and wide ranging with a large number of stakeholders involved and implications in many policy areas, and to be "planning" or design related. The term was used by Rittel and Webber (1973) who encapsulated their issue in "the aim is not to find the truth, but to improve some characteristics of the world where people live" (Rittel and Webber, 1973, p167). This clearly places wicked problems in the domain of "unwelcome situations". Though similar in analysis to Simon's ill structured problems (Simon, 1973), a wicked problem presents issues surrounding both its "solution" and subsequent "implementation". We start by examining the development of wicked problems.

3.3.2 The origins of wicked problems

An early article by C. West Churchman (1967) refers to Rittel using the phrase "wicked problems" in a "recent seminar", (at University of California, Berkeley) with Churchman suggesting that the phrase be used for:

> "that class of social problems which are ill formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing

….. the adjective “wicked” is supposed to describe the mischievous and even evil quality of some of these problems,...” (p B141)

Churchman makes the following observations on what Rittel said in the seminar: Rittel did not say how extensive were Wicked Problem’s; attempts to “tame” them included OR and Management Science; that this “taming” sometimes consisted of attempting to generate a consensus, and sometimes, as in the use of Operations Research, of “carving off’ a section of the problem and finding a feasible solution to that. Churchman remarks that “[I]n the latter case it is up to someone else (presumably a manager) to handle the untamed part” (p B142). This article suggests that practitioners and researchers were already aware of the existence of such problems.

Rittel and Webber’s introduction to the dilemmas and wicked problems was that the customers of professional planning were not satisfied with some of the outputs, and that the two key reasons behind this were “anti-professionalism”, stemming from the simple problems having been dealt with, and a historical imperative “thrown up by the course of societal events that call for different modes of intervention” (Rittel and Webber, 1973, p156).

It is necessary at this point to reflect upon the title of their 1973 paper which was “Dilemmas in a General Theory of Planning” (Rittel and Webber, 1973), and whose primary thrust was to demonstrate difficulties placed in the way of developing a universally applicable and repeatable theory which could be applied to the practice of “planning”. It is also necessary to appreciate that they used planning as a generic term and considered it included both design and planning and understanding or solving problems.

A general theory of planning, had it been possible, would, as Rittel set out in an earlier article, have been built on systems analysis, as it applied to tame problems. “The term ‘systems analysis’ means *attacking problems of planning in a rational, straightforward, systematic way, characterised by a number of attitudes which a systems analyst and designer should have”* (Rittel, 1972, p390, italics in original). These characteristic attitudes are given as a set of 5 personal qualities of the analyst: firstly rational, objective and scientific; secondly grasping the whole system, rather than smaller sections piecemeal; thirdly, necessarily interdisciplinarity; fourthly seeking to optimise “one measure of effectiveness”; and fifthly, innovative in terms of solutions found from the problem formulation. Armed with these attitudes ‘first generation’ system analysis steps are given as follows: Understand the problem, gather information about "the context from the viewpoint of the problem", analyse the information, generate solutions, assess the solutions and decide, implement, test, modify and lastly learn. Operations Research, which Rittel claims is a good example of this first generation approach, has the following exemplary steps: "define the solution space", "define the constraints", "define the measure of effectiveness", "optimise the measure of effectiveness" (p391). Rittel suggested that inadequate theory, insufficient information and multiple viewpoints and objectives placed difficulties in the way of the scientific approach. In the early 1970's there were advocates for the possibility of a general theory of planning (Ozbekhan, 1968), and the universal applicability of OR techniques, an argument that is still ongoing in Operations Research (Muller-Merbach, 2010).

3.3.3 The relation of wicked problems to systems thinking

Rittel and Webber have clearly identified a number of difficulties surrounding the use of hard systems Operations Research, but also the functionalist approach in its entirety, on the grounds that its assumptions were only applicable to tame problems (Protzen and Harris, 2010).

The explicit systems concepts used by Rittel and Webber are boundaries, feedback, and multiplicity of viewpoints. They examine the nature of problems, to a rather greater extent than the nature and method of solutions; in concluding that wicked problems are inherently insoluble, they place themselves clearly in Weinberg's middle number zone of organised complexity. They clearly do not favour a reductionist approach to problem solving but to an extent remain in the functionalist paradigm, with their desired planning model being based on cybernetics and adaptive systems. This position is reinforced by the frequent referencing of Ashby's work on cybernetics (Ashby, 1964) in Rittel's seminar series at Berkeley (Protzen and Harris, 2010, Rith and Dubberly, 2007).

3.3.4 Wicked problems as represented by 10 properties.

This section includes detailed discussion of wicked problems and their nature. They represent a class of problems, the properties of which, it was proposed by Rittel and

Webber would contribute to a series of "dilemmas" in the search for a general theory of planning, design and improvement which would be universally applicable. This section is set out in the following manner. We first present the 10 properties or characteristics of wicked problems (WP) as proposed by Rittel and Weber; these are set out in Table 3.2 below.

	Property as titled	As discussed by Rittel and Webber
1	There is no definitive formulation of a WP	The information needed to understand it depends on one's ideas for solution; Problem understanding and resolution are concomitant; If we can identify the root cause we have also formulated a solutions; context and decisions are key; every specification of the problem is a specification in which a treatment is considered
2	WP have no stopping rule	Because of property 1, there are no criteria for sufficient understanding, Because there are no ends to the causal chains that link interacting open systems, the planner can always try to do better. Processing stops for considerations that are external to the problem; e.g. time, money, patience
3	Solutions to WP are not true or false but good or bad	No conventionalised criteria for objectively deciding correctness or truth unambiguously which can be independently checked by others there will be different viewpoints but no single authority with the power to set formal rules to determine correctness

	Property as titled	As discussed by Rittel and Webber
4	There is no immediate and ultimate test of a solution to a WP	Any solution after implementation will generate waves of consequences over an extended virtually unbounded period of time; which may have undesirable consequences outweighing benefits of implementation; Any ultimate test requires waiting till all waves have worked through which we cannot do (no information about future or time available)
5	Every solution to a WP is a one shot operation; because there is no opportunity to learn by trial and error every attempt counts significantly	Small games don't have societal impact; Every implemented solution is consequential leaving consequences that can't be undone; large public works are effectively irreversible; whenever actions are effectively irreversible and whenever the half-lives of the consequences are long, every trial counts.
6	WP do not have an enumerable or an exhaustively describable set of potential solutions, nor is there a well described set of permissible operations that may be incorporated into the plan	No criteria to prove that all solutions identified and considered; It is a matter of judgement to enlarge the set or not; There are no finite set of rules for how to do social policy; realistic judgement is needed
7	Every wicked problem is essentially unique	Despite similarities there always might be an additional distinguishing property that is of overriding importance There are no classes of wicked problems in the sense that principles of solution can be developed to fit all members of a class. In the more complex world of social policy planning every situation is likely to be one of a kind
8	Every WP can be considered to be a symptom of another problem	Removal of the initial cause poses another problem of which the original problem is a symptom. There is nothing like a natural level of a WP. The higher the level of a problem's formulation the broader and more general it becomes"

	Property as titled	As discussed by Rittel and Webber
9	The existence of a discrepancy representing a WP can be explained in numerous ways. The choice of explanation determines the nature of the problems resolution	There is no rule or procedure to determine the correct explanation or combination of them. The modes of reasoning used in the argument are richer than those used in the scientific discourse. Because of the essential uniqueness of the problem (property 7) and lacking opportunity for rigorous experimentation (property 5) it is not possible to put hypotheses to a crucial test. Do not know strength of cause and effect, and probably not cause and effect.
10	The planner has no right to be wrong	Solutions to problems are only hypotheses offered for refutation. In planning the aim is not to find the truth but to improve conditions; planners are liable for the consequences of the actions they generate

Table 3.2 An analysis of wicked problems (based on Rittel and Webber 1973)

3.3.5 Discussion on wicked problems

The identification of a problem or problem situation is essentially a normative act, in which a less than ideal situation is observed which is capable of being improved, as represented in an eleventh property which is "the next consideration is to ask why it is not as it ought to be", which leads to the potential for "many explanations for the same discrepancy." (Rittel, 1972, p393).

This highlights the initial role of the observer in identifying a problem situation. Having "created" the problem, the observer / planner needs to collect information about the problem. Rittel and Webber's assertion is that this is driven by ideas for the solution or intervention already resident in the planner; ideas which have also shaped the initial description and identification of the problem. (Property (P)1).

No mechanism or rule exists to impartially determine whether the correct solution has been identified, nor for whether the implementation if any is complete. The exercise (solution search or implementation) ends for considerations "external to the problem", when resources (e.g. time energy money or patience) runs out. Rittel and Webber suggest that because of the necessity of this arbitrary cut-off, (an imposed boundary, possibly before a solution that is even "good enough" has been reached) the planner will always consider that improvements could have been made to the solution. The exploration of the problem and the solution is continuous (P2).

Wicked problems have no single universally agreeable answer. Judgements about improvement can only be made after the event. Different viewpoints about a problem will mean different ideas for its solution, and there will be no authority to set appropriate rules or make judgements (P3). Any actions taken will have widespread impacts over time and often have unexpected and on-going consequences (P4). Actions and interventions are irreversible and not amenable to experimentation (P5). There are potentially an infinite number of solutions and no rule set to find them (P6).

There is no feedback or learning loop which could allow for the construction of general practice or theory, which would enable either the practice of design and improvement to become better or more codified, nor will the quality of the solutions necessarily improve. Uniqueness is different to the absence of feedback. It is neither lack of rigour in a particular approach nor lack of information (P7).

As the boundary of the problem situation is expanded, so more issues and viewpoints can be included. The no stopping rule applies also to the drawing of a boundary (of any type) and hence what is included in the problem (P8). The problem can be explained in numerous ways. This often interpreted as requiring a social dimension. But the phrase can be explained in a number of ways does not imply the need for two or more observers. The requirement could be met by a single reflexive observer examining the problem situation from more than one solution direction (P9). The role and responsibility of the expert leaves them open to personal moral liability for choices made. In addition, according to Rittel and Webber, expertise and ignorance are equally shared among participants in a wicked problem (P10).

A diagrammatic view of a wicked problem can be prepared. The diagram retains the format of problem identification, information gathering and analysis, creation of solution set, decision, and action that might be found in solving a tame problem, using the standard process of systems analysis (Rittel, 1972). The elements in this problem system are the problem solver and other actors, the problem, the solution and the intervention. The figure indicates where the properties impact on these stages of the problem solving process. The property is given by a P followed by its number e.g. P9.

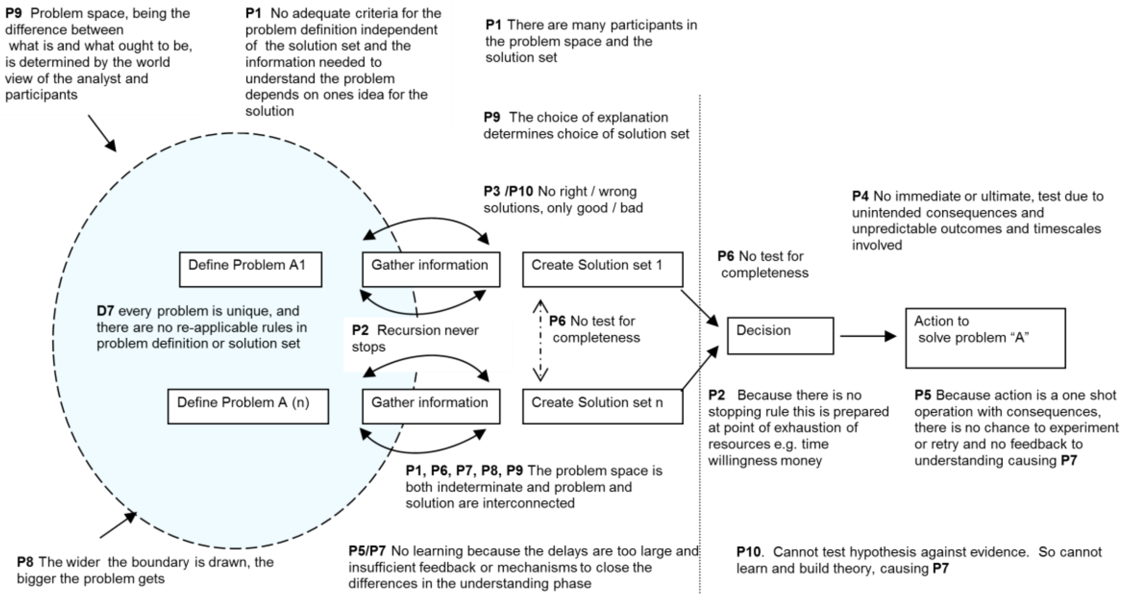

Figure 3.1 Representation of where the properties impact the problem solving process

The problem space, the description of the problem, defined as the difference between what is and what ought to be, (P9) is set by these actors, who are likely to hold different viewpoints on both what is and what ought to be (P1). Every problem is unique (P7); the wider the boundary is drawn the more interconnected problems are included (P8).

The choice of explanation for the problem determines the choice of solution set (P9) and there is no test for completeness to ensure that all the sets of solutions are identified or included for consideration (P6). There are no adequate criteria for defining the problem which are independent of the solution set (P1). The information needed to understand the problem depends on the choice of solution set (P1), and as more information is gathered and faced against the solution set, the solution set is liable to change; this recursive dialogue of testing, refining, understanding and information gathering never stops (P2). There is no test for completeness to ensure that all solutions are identified or included for consideration (P6). The analytics process stops when the participants run out of resources, among which are time, energy, willingness and money (P2).

In moving from solution set to just one "solution" to be implemented there is no right / wrong set of rules to test the chosen solution; there is only a subjective interpretation of good or bad, or possibly better/worse, (P3 and P10). How to reduce the many solutions in the solution set to a plan or a project list? There is no adequate test for completeness (P6) and no stopping rule (P2).

It is impossible to judge whether the right action has been taken. There is no immediate or ultimate test of whether the action is right because of unforeseen and unpredictable outcomes and consequences, and the timescales involved (P4).

Action/intervention is a "one-shot operation"; there is no chance of experimentation (P10), or undoing or retrying actions (P7), and thus there is no possibility of feedback to the problem understanding side of defining the problem and finding a solution. There is no learning because the time delays are too large, and there are insufficient feedback mechanisms (P5). This causes every problem to be unique, since there is no possibility of creating re-applicable or replicable rules in problem or solution determination (P7).

3.3.6 Deriving themes from wicked problem properties

Having now reviewed the stages at which the properties of wicked problems occur, the preceding discussion indicates that they can be located in more than one stage. This suggests that there are underlying characteristics within the properties and we will now turn to a consideration of these, based on Rittel and Webbers discussions (Rittel and Webber, 1973).

For example, there appears to be a general feature around multiple understandings and viewpoints. Property one includes the statement that "the information needed to understand it depends on one's ideas for solution", also "the problem understanding and resolution are concomitant" and that "every specification of a problem is a specification... in which treatment is considered". Property three states that "different viewpoints will exist" whilst property nine asserts that "there is no rule or procedure to determine the correct explanation or combination of them". When taken together these statements from four different properties point to a theme of *multiple explanations*.

A second feature is around the continuing nature of the process. Property two states that there are no "criteria for sufficient understanding" of the problem; and that the process stops for considerations such as time that are not related to the problem. Property three points out the lack of a test for the right answer. Property four states that there is "no ultimate test of a solution" as there will be effects continuing over long periods of time, and property nine implies that this will mean solutions can't be tested. Property six means that it is not possible to ensure that all potential solutions have been identified, and that the solution set is not bounded. Taken together these statements from a further four properties suggest a theme of *no stopping rule*.

A third feature is around connections and interconnectedness. Property three says that there are many causal links between problems, with property nine adding that the identifying cause and effect will be difficult. Property eight says that removing a cause merely reveals another problem, and that as the boundary is drawn both the more problems will be drawn in, and the less specific will be their nature. That suggests a theme of *interconnectedness.*

A further broad area exists around the nature of the intervention. Property four says that implemented solutions create long term consequences over an extended period of time; some of these may be unexpected or "undesirable". This is reinforced by property five which indicates that it is not possible to test solutions making any intervention a "one shot operation", and that each intervention has a significant impact. This suggests a theme in which *intervention has consequences*.

A further clearly identifiable area is one of uniqueness, and lack of ability to learn from the process, to create universally applicable treatment principles. Property seven puts forward the existence of distinguishing properties between problems, meaning that no two problems are alike, and generally applicable rules cannot be developed. There is a clear theme of *uniqueness*.

The final broad area is that of the involvement and motivation of the planner. Property two says that the planner can always "try to do better", and property three that there are no objective criteria for correctness, and that there is no "true or false" answer. Property six extends this to cover the planner's role in setting the boundary, in the absence of a clear set of rules, and finally property ten clearly makes planners responsible for the consequences of their decisions. This suggests a theme of *planner's responsibility*.

We have synthesised these themes which can be identified within the properties, and may be considered to represent the underlying characteristics of wicked problems. To summarise, these are:

- Multiple explanations
- No stopping rule
- Interconnectedness
- Intervention has consequences
- Uniqueness
- Planners responsibility

The themes are a core part of this research. They will be used as a basis for our empirical analysis and we will be seeking evidence of their impact within our data. To help with this analysis we have operationalised them as follows:

- Multiple explanations: The information needed to understand the issue is inconsistent and allows multiple explanations,
- No stopping rule: there are no criteria for knowing optimum
- Interconnectedness: Circular causal chains with strong linkages
- Interventions: Interventions have unintended, significant consequences
- Uniqueness: Cannot develop or apply a generalisable solution
- Planner's responsibility: "planner" taking ownership of situation.

3.4 The application of wicked problems

Most researchers consider that a key aspect of wicked problems is their large social nature and the presence of multiple viewpoints through the inclusion of a number of actors and participants. Wicked problems have been located in a wide variety of areas. These include: Public policy and governance (Weber and Khademian, 2008, Sorensen and Torfing, 2009, Sam, 2009, Andersen et al., 2006, Marshak, 2009); Strategy

(Henderson, 2007, Camillus, 2008); Corporate Governance (Sachs et al., 2010); Climate change (Kelly et al., 2012, Horiuchi, 2007); Professional practice (Schon, 2001); Leadership (Grint, 2010, Wheatley and Crinean, 2005, Beinecke, 2009); Financial market collapse (Mainelli, 2008, Kesavan et al., 2009); Environmental policy and planning (Farrell, 2011, Jaffe and Al-Jayyousi, 2002, Kirlin, 2008); Managing public sector organisations (Jackson and Stainsby, 2000); Healthcare (Fraser, 2009); and Planning (Hartmann, 2012, Adams, 2011). Describing a problem as "wicked" can prompt for specific types of intervention, either through leadership strategies, or the use of participative methods (Grint, 2005).

The identification and location of wicked problems in a societal context, and the inability of "hard" Operations Research to properly deal with such contexts led to the development of approaches to manage them based on the argumentative and political approach (Protzen and Harris, 2010). This prompted the search for ways of dealing with the process of discourse and argument. Among these are many of the systems approaches set out in SOSM under the "interpretive paradigm", such as Interactive Planning, Strategic Assumption Surfacing and Testing, and soft systems methodologies. These problem structuring methods use a variety of techniques to manage the process and their focus is directed more at structuring the problem for the benefit of the participants than with their solution or implementation (Rosenhead, 2006).

The common features of these various examples of the location of wicked problems are their large, societal and important nature (de Tombe, 2002), in which there will be significant impacts if solutions fail (Kettl, 2006), and the existence within them of multiple viewpoints, as well as potentially a lack of data (Mingers, 2011). However as evidenced by the analysis of empirical work set out in section 3.5 below, wicked problems are rarely identified in operational and process issues.

If as has been suggested, the boundary between ill structured and well structured is not clearly defined, and many problems considered to be well structured may become ill structured on further reflection (Simon 1973), in the same manner it should be considered whether wicked problems are the norm, with the exception being tame (Coyne, 2005). The reality of experience within an organisation may reflect this view (Holt, 2004). This further raises the possibility that wicked problems may exist in different more tightly bounded contexts. Certainly dealing with wicked problems is not straightforward, and even repeated attempts may be unsuccessful (Marshak, 2009, Worley, 2009).

3.5 Empirical work on wicked problems

3.5.1 Introduction

The practical application or empirical testing literature using wicked problems as a basis could not be considered extensive.

We review below some examples of where "wicked problems" have been used as a basis for analysis employing all the 10 properties and also some examples on where the phrase has been used rather more as a label in opposition to "easily solvable".

Kesavan, Mascarenhas, Kesavan, & Crick (2009) employ the 10 original properties to examine the factors underlying the recent global banking crisis, while Klinzing (2010) does similarly, but in a practical engineering example. Further examples of practical descriptive use of wicked problems are provided in public management, (Blythe et al., 2008, Christie et al., 2009), municipal car parking, (Kerley, 2007), and instructional design (Becker, 2007).

3.5.2 Using wicked problems to analyse the global banking crisis

Kesavan, et al., (2009) have examined the 2008 financial crisis as it affected the United States, choosing to frame it as a wicked problem: "where the problem statement is not independent of its solution and vice versa" (p56); they seek to "establish that the current financial crisis is a wicked problem....whose solution space should be carefully explored so that quick solutions....do not have long standing unintended consequences..." (p56). Taking a selection of large financial firms, they describe how each was affected by the banking crisis, and go on to score for wickedness against each of the 10 properties the experience of the following firms: Federal National Mortgage Association (FNMA, ("Fannie Mae")); Federal Home Loan Mortgage Corporation, (FHLMC, ("Freddie Mac")); Lehman Brothers, (LB); American International Group, (AIG); Washington Mutual, (WM). They also provide a score for financial markets in general (FM). The attributed "scores" using an "X" to attribute the existence of the particular wicked quality, are set out in Table 3.3.

	Characteristic of Wicked Problem	FNMA	FHLMC	LB	AIG	WM	FM
1	There is no definitive formulation of a wicked problem	X	X		X	X	X
2	Wicked problems have no stopping rule	X	X	X	X	X	X
3	Solutions to wicked problems are not true or false, but good or bad	X	X	X	X	X	X
4	There is no immediate and no ultimate test of a solution to a wicked problem SOLUTIONS HAVE UNEXPECTED CONSEQUENCES OVER TIME	X	X	X	X	X	X
5	Every solution to a wicked problem is a one shot operation; because there is no opportunity to learn by trial and error, every attempt counts significantly				X	X	X
6	Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well described set of permissible operations that may be incorporated into the plan				X	X	X
7	Every wicked problem is essentially unique	X	X		X	X	X
8	Every wicked problem can be considered to be a symptom of another problem	X	X	X	X	X	X
9	The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution. / INVOLVES MANY STAKEHOLDERS	X	X	X	X	X	X
10	The Planner has no right to be wrong / EXECUTIVES RESOLVING WICKED PROBLEMS	X	X	X	X	X	X
	Total "score"	8	8	6	10	10	10

Table 3.3 Global Financial Crisis as a wicked problem (adapted from Kesavan, et al., 2009)

We can see from the above table, that for properties 4, 9 and 10, Kesavan, et al. use a slightly different interpretation and wording of the property to that suggested by Rittel and Webber. It is possible from their descriptive analysis to find support for LB failing their wicked property test on 1 and 7, in that LB's collapse is ascribed to continuing to invest in overpriced property developers after the commencement of the decline in real estate prices, including one investment of US$ 22.2bn in October 2007. It is possible to conclude that they consider that this would not have been the only time a company failed due to bad acquisitions and thus there was a clear cause and an element of non uniqueness. It is however unclear from the accompanying narrative why FMae, FMac, and LB all failed to exhibit evidence of either property 5 or 6 ("one shot" and "inexhaustible solution set").

They are much clearer in their assertive evidence that the whole crisis is a wicked problem giving justifications for each of the properties. For example, in respect of property 1, " A single root cause of the current financial meltdown is impossible to identify" (p63), and for property 7, "given the multiplicity of causes the 2008 United States' financial crisis is not identical to anything in the past" (p64).

Kesavan, et al. conclude that "the current dilemma of bailing out the financial sector very nearly meets the .... 10 guidelines for wicked problems outlined by Rittel and Webber" (p68), suggesting that although the methodology is not transparent, their view is that there can be "degrees" of overall wickedness.

Their recommendation on what happens next introduces a different type of discourse or argument in that their suggested solution is one in which the "market" replaces government intervention. "The problem statement and resolution – search should both be within the framework of free market systems, where the free enterprise should be able to design its own correcting mechanisms without government control or dependence" (p62), although other than the obvious difficulty of dealing with a wicked problem no justification is given for this statement. After some discussion they conclude that the "symptomatic" solution of a bail out that was employed by the U.S. government, rather than a systemic solution is, given that the financial crisis is a wicked problem, unlikely to be the best solution. However their analysis demonstrates that it is possible to extend the use of wicked problems to a specific instance by using the properties of wicked problems individually to assess wickedness.

3.5.3 Using wicked problems to analyse pneumatic conveying

Klinzing (2010) moves from the potential application of wicked to global issues such as health, climate and energy to an examination of the issues surrounding pneumatic conveying of particulates which have the ability produce to unexpected outcomes due to the complicated relationships between them (i.e. to create wickedness, essentially in conditions of uncertainty). Among these are size distribution, shape, abrasiveness, environmental conditions, densities, tackiness, particle flows and pressures. The interactions affect the ability to predict behaviour and design trouble free conveyors (Klinzing, 2010).

The effect of these complicated interrelationships in causing unpredictability leads Klinzing to conclude the presence of a wicked problem, which it may not be possible to tame through technical means e.g. simulation and modelling, where there is an "inability to portray certain physical phenomena correctly" (p361) in part due to simplifying assumptions made, some of which may not be explicit. "Simplification may mean we miss something that may be at the root of wickedness" (p361). Klinzing moves on to particular issues in pneumatic conveying where wickedness might be expected to exhibit itself, and where there are significant design issues, among which are transition flows, multiple bends/T junctions, turbulence and particle interaction, and the behaviour of powders over long distances.

This review and examination enables him to consider each of Rittel and Webber's 10 properties in turn, and the degree to which these issues exhibit wickedness, using a yes / sometimes / no scale. The results are set out in Table 3.4, along with the reasons given by Klinzing for his particular decision.

	Property	Conclusion on existence of property with respect to conveying
1	There is no definitive formulation of a wicked problem	Yes: given that not all the parameters are known, nor what values they might take
2	Wicked problems have no stopping rule	Yes, sometimes: it is generally not the case, but there may be exceptions in trouble shooting
3	Solutions to wicked problems are not true or false, but good or bad	Yes: there is little scope for morals in pneumatic conveying
4	There is no immediate and no ultimate test of a solution to a wicked problem	Yes: unexpected consequences can be generated, and there is often no test that predicts the sustainability of a particular solution
5	Every solution to a wicked problem is a one shot operation; because there is no opportunity to learn by trial and error, every attempt counts significantly	Sometimes: Though it is possible to learn from trial and error, and get more information it is not possible to get perfect information about the future; also note that feed forward controls may not operate in the face of unintended outcomes
6	Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well described set of permissible operations that may be incorporated into the plan	No: We think we have all potential solutions
7	Every wicked problem is essentially unique	Unlikely: previous answer to property 6 refers)
8	Every wicked problem can be considered to be a symptom of another problem	Yes: The effect of relationships is apparent and often other problems are uncovered
9	The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.	Yes: It will often be a team dealing with investigations
10	The Planner has no right to be wrong	Agree: This statement "aligns with consultants who are often wrong"

Table 3.4 Conveying analysed as a wicked problem (adapted from Klinzing, 2010)

Klinzing applies this table to 3 types of pneumatic conveying: dilute phase, dense phase, and transition phase, and concludes that dilute phase is "wicked under certain conditions", dense phase has "higher probability of wickedness" and transition phase a "high potential to be wicked" (p367).

Klinzing's prescription for dealing with any identified wicked problems is as suggested by Rittel and Webber, namely argument and discourse. Solution finding will involve teams and groups, and a way of managing communication and discussion e.g. brainstorming.

3.5.4. Using wicked problems to analyse urban car parking

Kerley (2007), uses an examination of the details of " day to day life" as a motivation to build theory applicable to public management, asserting that the provision and management of public car parking is a classic wicked problem, given its social nature and the likelihood that any solution will be likely to create discontent somewhere, producing "disagreeable outcomes for some people as they generate benefits for others" (p527). Kerley uses this analysis to indicate that even at this apparently mundane level there is increasing complexity and wickedness in public service provision, to which solutions may be more directness in communicating issues and skill in organising such services. "[F]or government....the big grand decisions are either gone (the motorway building programme) or gone wrong (pension provision, health service information technology projects)" (p527).

3.5.5 Using wicked problems to analyse public management

Both Blythe, et al., (2008), and Christie, et al., (2009), use examples of public management to describe them as wicked but do not follow up the analysis. Christie, et al. refer to the leadership of local government authorities in Australia as a "wicked problem", with respect to engagement with the community on environmental issues and "complex physical infrastructures" (p84), rather than the environment itself being the problem, and Blythe, et al. discuss the process, within an action research project, of gaining community agreement to the wicked problem of a large scale canal dredging project involving hazardous waste in the United States. Neither group of researchers seek to use wicked beyond a descriptive label.

3.5.6 Using wicked problems to analyse Instructional Design

Becker (2007) takes a similar approach to Kesavan, et al., (2009) by examining how Instructional Design (ID) (creating learning interventions and models) qualifies as a wicked problem by stating each of the 10 properties and analysing their relevance to qualities that ID exhibits (Becker, 2007). Becker identifies ID, though a relatively new subject, as suffering from the same ills as software design, which is the failure to build a universally accepted and "prescriptive model of design". Empirical research carried out by Dicks and Ives (2008), showed that a designer is unlikely to use a theory based approach, using instead technical social and intellectual skills as required.

3.5.7 Discussion of the empirical work

We can make the following brief observations on the empirical application of wicked analysis. Firstly there is apparently a wide range of applicability of wicked, from leadership through car parking to pneumatic conveying. Secondly, the properties can be reinterpreted through using the detailed discussion of each point that Rittel and Webber engage in for example the "title" to property 4 (no immediate or ultimate test of a solution) does not include the insight of an intervention causing unintended consequences over time, and allied to this, some researchers add extra conditions. Thirdly there seems to be an emerging view of the importance of short and long term time horizons, and the need often for urgency to take action. Fourthly, there are comments about the importance of relationships between the elements causing uncertainty, and also the problem drifting and changing its nature as it is being worked on (Becker, 2007).

Finally, little real empirical work has been done, and the articles we have reviewed do not contain an explicit methodology. Researchers who have performed empirical work lack a clear methodology for justifying their position but tend to agreement on degrees of wickedness depending on how many of the 10 properties of wicked problems scored "yes". All would seem to agree that the propositions are binary – either being present in a particular problem or not; for example, there is either a stopping rule or not. "Wicked problems" can often just be used as a label to juxtapose against tame or simple.

3.6 Research Objectives

In this chapter we have reviewed the nature of wicked problems and their possible applications, and how work based on them has been carried out empirically. We have identified a number of themes underlying the original 10 properties, for which we formed operational definitions.

We have indicated that most applications of wicked problems are in the social or organisational domains and are predominantly concerned with design, planning or complex issues (e.g. global warming), where multiple viewpoints, interests and values are to be expected, and most applications tend to use wicked as a means of indicating that arriving at a solution will tend to be difficult, and based around dealing with people.

We reviewed the empirical work carried out using wicked problems as a basis and found it to be mainly applied to social, design and planning domains. The empirical work within an operational context is limited, and based loosely on the 10 properties rather than their underlying concepts, and little evidence is provided either of the methodology or for the conclusions drawn.

The research objective is to seek to address this lack of empirical work on wicked problems within operations by examining an operation exhibiting performance issues in order to derive the characteristics of a wicked operational problem. We will do this by adopting a systems approach based on examining structure and behaviour.

Head and Alford (2008) strongly support using a systems approach to addressing wicked problems. They suggest that systems approach would include understanding not only outcomes (behaviour) but also the “web of inputs, processes and outputs that lead to them” (p16). The method would be initially to frame the problem in “tentative terms” which would be expected to change as exploration developed. This acts as a “starting point” from which one first works backwards to “compile a diagram of factors which seem most likely to cause the problem” (p16), seeking ultimately to find initial factors. One can then progress forwards seeking to identify problems that might be caused by these factors or any interventions. The method is based on first understanding how the structure and core operating processes inter-relate within a specific organisation to create the problem, before potentially widening the system boundary to identify other internal and external factors influencing the behaviour. This is in essence the approach adopted in our research. We do this by conducting an in depth case study of a single operation which is exhibiting significant and unresolved operational issues using an immersive approach (Hill et al., 1999).

This enables us to frame our research question:

What are the characteristics of wicked operational problems?

3.7 Concluding remarks

Following on from the discussion of system approaches in the previous chapter, this chapter has reviewed some common frameworks concerning the nature of problems. These tend to be based on binary descriptions which relate to the ease with which they can be dealt. We then considered in detail the nature of wicked problems building on the well known 10 properties of wicked problems, developing a pictorial representation of where they impact the problem solving process. We have synthesised the 10 properties into six themes, namely: Multiple explanations, No stopping rule, Interconnectedness, Intervention has consequences, Uniqueness, Planner's responsibility, and developed operational definitions.

Wicked problems are seen within the literature as being of significant size and having a societal impact, as evidenced by the large number of issues to which the label wicked is attached. The examination of the empirical work using an analysis derived from wicked problems concept indicated that it is not extensive, and lacks a clear methodology. Research that included operational issues is extremely limited.

From this review we have developed our research objective, which is to address this lack of empirical work concerning wicked problems and operations, and we have developed a research question: "what are the characteristics of wicked operational problems?" We now turn to a discussion on a suitable methodology to examine this objective in chapter 4.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter introduces the research philosophy and methodology employed and its underlying philosophy. It moves through the philosophical underpinning of management research to the research design employed.

We review the influences on the selection of a particular research methodology, and available research approaches. This is followed by a review of the types of methodology employed within Operations Management (OM). We follow this with a discussion of the research design based on the requirements of the research objective and a systems approach, and set out the adopted research design.

This chapter is set out in the following sections:

4.2 Research Choices

4.3 Philosophy underpinning Management Research

4.4 Research Approaches

4.5 Research Methods in Operations Management

4.6 Justification for case study

4.7 Overview of Research Design

4.2 Research Choices

The shape of this chapter is influenced by the structure and thinking behind Saunders, et al.'s "research onion" (Saunders et al., 2003) an adaptation of which is set out in tabular form in Table 4.1 below. This sets out the various layers of factors and choices that need to be made that inform the choice of research methodology. The depiction covers philosophical themes, research paradigm, research approach, research methods, time horizons and finally data collection techniques. Potential descriptors of each of the theoretical levels of the "onion" exampled by Saunders, et al. are set out in Table 4.1 below.

Level	Examples of topics / choices to be made
Philosophical themes	Ontology / epistemology
Research paradigm	Positivism / realism / critical theory / constructivism
Research approach	Deductive / inductive
Research methods	Experiment / survey / case study / grounded theory / action research
Time horizons	Cross sectional / longitudinal
Data collection technique	Sampling / observation / interviews / questionnaires / secondary data

Table 4.1 The Hierarchy of Research Choices (adapted from Saunders, et al., 2003)

In the pictorial representation of the "onion", often portrayed by a series of concentric circles, a visual suggestion is made from the juxtaposition of terms in the diagrammatic "onion" that some positions and choices lead to others e.g. a positivist would tend to use experiment and survey, whereas a constructivist would tend to use for example action research. This is not however an immutable rule and certainly not at the level of data collection technique. However choices have to be made and should be made explicit by the researcher as each "level" is crossed since a position adopted at an outer level may preclude later choices.

4.3 Philosophy underpinning Management Research

In this section we will examine the philosophical underpinnings to management research. We start by reviewing a model based on researchers' potential approaches to change in social organisations, before extending our discussion to involve other possibilities.

A frequent discussion centres on a "choice" between (logical) positivism and slightly relaxed variants such as interpretivism. The general starting point is a schema proposed by Burrell and Morgan (1979). This, by setting up "ideal types" of "subjectivist" and "objectivist", examined within their reaction to the multiple facets of ontology, epistemology, human nature and methodology, creates the approaches of functionalism and interpretivism. This is set out in Table 4.2 below.

Approach to	Objectivist	Subjectivist
Ontology	Realism	Nominalism
Epistemology	Positivist	Anti –positivism
Human nature	Determinism	Voluntarism
Methodology	Nomothetic	Ideographic
Resulting Position	Functionalist	Interpretivist

Table 4.2 Derivation of Functionalist and Interpretivist Positions (based on Burrell and Morgan, 1979)

This analysis derives the two paradigms of "functionalist" and "interpretivist". But in examining "sociological paradigms in organisational research", subjectivist / objectivist is not the only ideal scale that Burrell and Morgan are interested in. They continue with an examination of descriptions of order and conflict in social organisations thus creating another ideal dimension reflecting the researcher's approach to change. This may be either regulatory, in which the issues of power and change play little part, or radical where change is necessary to emancipate and create potential, either seen from a point of view of structure, or socially created arrangements. This allows Burrell and

Morgan to create a 4 box model in which sociological schools of thought can be placed, describing their basic theoretical assumptions and methods of operating. This model is set out in Table 4.3 below.

		Approach to Ontology and Epistemology	
		Objective	Subjective
Approach to change within social organisations	Radical change	Radical Structuralist	Radical humanist
	Regulatory	Functionalist	Interpretive

Table 4.3 Radical and Regulatory Approaches to Change (Adapted from Burrell and Morgan, 1973)

Each paradigm is asserted by Burrell and Morgan to be incommensurable and hence mutually exclusive with the others which implies the absence of a means of adjudicating which paradigm is better at solving problems. The potential of the extension of the Burrell and Morgan paradigm model beyond regulatory approaches to much more strongly interventionist approaches seeking to replace traditional structures and arrangements is often ignored by traditional approaches to Operations Management (Johnson and Duberley, 2000). Burrell and Morgan also assert with this framework that the researcher's approach to both ontology and epistemology must be either objective or subjective, but this has been challenged by later analysis to which we now turn.

This functionalist / interpretivist divide can create or force a duality which may be limiting. An alternate analytical framework in which to understand philosophical approaches to management research is set out by Johnson and Duberley (2000). They identify 5 broad approaches as follows:

- positivist,
- conventionalist,
- post modernist,

- critical theory
- critical realism.

Johnson and Duberley see the difference between functionalist and interpretivist as being less substantial than do Burrell and Morgan. In examining the epistemic commitments of logical positivism and interpretivism, using the dimensions of neutral observational language, correspondence theory of truth, inductive verification of theory, deductive falsification of theory, practical utility of theory, and the unity of natural and social science methodology, Johnson and Duberley only see a difference in the latter, in that interpretivists consider that natural science methodologies cannot be applied to social science problems.

But they agree that the key difference between alternate paradigms or schools remains their approach to ontology and epistemology. They indicate that the conventionalist rejection of the possibility of a theory neutral observational language can lead to relativism and subjectivism; post modernism, along with its rejection of grand narratives has also to address relativism without returning to a positivist stance; critical theory in its critique of positivism and neo - positive interpretivism, has an overtly political stance, which can be linked to Burrell and Morgan's radical change approach to organisations. Critical realism acknowledges the role of the subjective observer in interpreting the physical world, and indicates that social scientific enquiry is directed at producing causal explanations that can direct interventions (Johnson and Duberley, 2000). Critical realism accepts reality as the object of knowledge but also that this is mediated through mental and social constructs.

Critical realism has a strong pragmatic element, and uses experience as a basis for learning. Pragmatism connects ends and means with the requirements that both be subjected to validation based upon actual rather than theoretical considerations (Johnson and Duberley, 2000). Pragmatism's epistemology builds knowledge based on experience, leading to the major aim of science being improvement (Emison, 2004).

Johnson and Duberley conclude that "while the truth may well be out there we may never know it in an absolute sense because we lack the necessary cognitive and linguistic means of apprehending it. [however] …from the pragmatic - critical realist stance we can develop and indeed identify, in a fallible manner, more adequate social constructions or reality by demonstrating their variable ability to realise our goals, ends or expectations" (Johnson and Duberley, 2000, p163). What remains important is what works and what is useful.

A contribution of this preceding discussion has been to elaborate on and place in context Jackson's 4 paradigms (discussed in Chapter 2), of functionalism, interpretivism, emancipatory, and post modern (Jackson, 2006). The systems approaches described by Jackson, and indeed much of systems thinking emphasises the role of the observer in drawing the system by abstracting elements in which they are interested from a wider reality, by defining boundaries, recognising alternate viewpoints and by doing so potentially defining that reality subjectively. It also provides an opportunity for the researcher to declare a personal position in respect of his research. We will adopt a critical realist – pragmatic approach, in which the purpose of management research becomes explanations which can guide interventions. This combines realist ontology, with a subjective epistemology.

4.4 Research Approach

4.4.1 Introduction

In this short section we consider the "onion" layer referred to by Saunders, et al., (2003) as "research approach" with the key choices being between inductive and deductive approaches; we will also explore the nature of theory, and examine the differences between theory building and testing.

4.4.2 Induction and deduction

Induction and deduction are two complementary methods of generating theory and knowledge, whose use tends to lead to different research methodologies.

"Induction is a reasoning process through which theory is generated out of specific instances of observation and experience" (Johnson and Duberley 2000, p16). Deduction is also a reasoning or inference process but generates theory or knowledge by creating hypotheses about laws and relationships, and subsequently devising tests which may prove or disprove them (Easterby-Smith et al., 2002).

Table 4.4 gives a broad overview of the implications of each method and differences between them for research design.

Deduction emphasises:	**Induction emphasises:**
Scientific Principles	Gaining an understanding of the meanings humans attach to events
Moving from theory to data	A close understanding of the research context
The need to explain causal relationships between variables	The collection of qualitative data
The collection of quantitative data	A more flexible structure to permit changes of emphasis as the research progresses
The application of controls to ensure validity of data	A realisation that the researcher is part of the research process
The operationalisation of concepts to ensure clarity of definition	Less concern with the need to generalise
A highly structured approach	
Researcher independence of what is being researched	
The necessity to select samples of sufficient size to generalise conclusions	

Table 4.4 Implications of deduction and induction for research approaches (based on Saunders, et al., 2003)

Adoption of a deductive or inductive approach influences the type of method subsequently used. Filippini suggests that an inductive approach would tend to be used in case studies and conceptual modelling and building typologies, whereas a deductive approach would be used in simulation and modelling (Filippini, 1997). Both approaches are used in developing theory, the nature of which we now consider.

4.4.3 The nature of theory

In an extensive literature review Colquitt and Zapata-Phelan provide a wide range of definitions of theory. These extend from a set of relationships, variables and predictions, to accounts of social processes. Equally extensive are the number of ways in which the strength of a theory can be measured, from its ability to make predictions, through the richness of its narrative, to its insights or revelations. A theory is a way of simplifying reality, and reducing complexity, enabling easier framing of questions (Colquitt and Zapata-Phelan, 2007).

"[A] theory is an explained set of conceptual relationships" (Wacker, 2008, p6), which are made up of related definitions, domain, relationships and predictions. The definitions answer the "who" and "what" questions, the domain the "when" and "where" questions, the relationships the "how" and "why", and the predictions cover the predictive "would" and "could" and the more normative "should" questions (Wacker, 2008). According to Wacker, "good" theory qualifies each of these 4 concepts with the qualities of precision, parsimony, uniqueness generalisability, abstraction, consistency and refutability or falsifiablility.

4.4.4 The development of theory.

There is general agreement amongst researchers of the key stages in developing theory, which is considered as being an ongoing process starting with observation of reality, and ending with some form of testing against reality. The key steps in theory building are the definition of variables, the specification of the domain in which the theory can operate, the specification and building of relationships and logical models, and then testing through making predictions and gaining empirical justification (Wacker, 1998). Theory building is a continuous "process of identification, explanation, prediction and understanding" (Meredith, 1998, p442).

In theory building the activities around research questions would concern the identification of key variable and the linkages between them, and potentially the reasons for such relationships ; theory testing would expose the theory to more data, in more areas, and check for anomalies in predictions or behaviour (Voss et al., 2002). They propose that an even earlier stage might be "exploration" in which the research would be designed to delineate areas of interest.

Filippini suggest there are 3 stages in developing a theory: description, explanation, and testing. These stages broadly consist of identifying interesting elements often using descriptive research, building an explanatory framework of constructs and relationships to generate hypothesis for testing empirically, and a final phase of modification and development through testing (Filippini, 1997).

4.5 Research Methods in Operations Management

4.5.1 Research Methods

This section reviews the potential research methods available to O M and acknowledges current suggestions and calls for development and extension. The following section will justify the choice made for this research project in the light of applicable development opportunities. The purpose of these two sections is to review the field of OM research methods and justify the chosen methodology.

This is the level in Saunders, et al.'s typology that seeks to prompt enquiry into method and data collection techniques. Research methods may be considered to be the broad means by which reality is engaged with, in which the researchers adopted paradigm engages a methodology by which data will be collected, and what will be the more detailed tools employed.

Saunders, et al. describe the following generally accepted research methods in their "onion": experiment, survey, case study, grounded theory, and action research. Filippini (1997) expands these to the following methods: modelling, simulation, survey, case study, field study, laboratory experimentation, and theoretical/conceptual. A broad overview is given by Easterby-Smith, et al., (2002) who state that research methods or designs can include action research, case studies, critical or cooperative enquiry, ethnography, grounded theory, experimental design, participant observation, and surveys.

Gupta, et al. describe the following empirical methods: qualitative (obtaining non quantitative data direct from subjects through interviews), case study (data collection over extended periods of time from one or more sites), field research (involving multiples site visits, but less involved time than a case study), laboratory (controlled experiments), archival research (using existing information sources and reports) and surveys (using preformed questionnaires for subsequent analysis) (Gupta et al., 2006).

4.5.2 Differences between methods

Any research method needs to achieve rigour. The attributes of rigour are generally held to be:

- internal and external validity
- repeatability or reliability
- generalisability.

Validity covers the extent to which the operationalisation of the construct and subsequent measurement is accurate, and whether the design of the research is unbiased; repeatability deals with whether the design is sufficient to reproduce results if reperformed, and generalisability the extent to which the results can be extended to other domains.

Easterby-Smith, et al. (2002) point out that attaining rigour in research methods will be approached differently depending on the researcher's viewpoint, the principal possibilities being given as positivist, relativist and social constructionist. They state that the aims of researchers from each different paradigm will differ in relation to how they achieve validity, reliability, and generalisability. For example the approach of a positivist to internal or construct validity will be related to how closely the measures used reflect reality, and whether or not the correct relationships have been identified; a relativist will be more concerned that sufficient viewpoints and perspectives have been included, and a social constructionist will ensure that the experiences of the parties involved have been correctly accessed.

An analysis of how the different viewpoints of the researcher affect methods of attaining rigour are set out in Table 4.5 below.

Means of achieving rigour	Positivist	Relativist	Social constructionist
Internal Validity / construct validity	Do measures correspond to reality? Has the correct causal relationship been identified?	Are there a sufficient number of perspectives?	Is access gained to experiences of those involved?
Reliability / internal	Is the research consistent? Are the measurements and results repeatable?	Are observations repeatable by other researchers?	Is there transparency in making concepts from raw data?
Generalisability / external What is the domain of the findings	Does the study confirm or deny existing findings? To what extent can the findings be extrapolated beyond the research?	Is the sample representative of a more general population?	Do the concepts and theory have relevance to other settings?

Table 4.5 Different research viewpoints in achieving rigour (adapted from (Johnson and Duberley, 2000, Carlile and Christensen, 2004, Voss et al., 2002, Yin, 2003, Easterby-Smith et al., 2002)

4.5.3 The balance between theoretical and empirical research in Operations Management

Surprisingly for an applied discipline such as OM it was only in the 1990's that there was a "significant and welcome change towards both practice and theory driven empirical research in the OM community" (Gupta et al., 2006, p433). Earlier work had concentrated on perfecting and extending mathematical based techniques such as stock management and queuing theory. A review of papers published between 1992 and 2005 showed roughly equal shares (approx. 38%) for empirical research and modelling / analytics, although the trend over the period for empirical work showed an increase from 30% to nearly 50% (Gupta et al., 2006).

There is an acknowledged need for more empirical work within OM. Although calling for more empirical work, Filippini (1997) suggests this should be integrated with theoretical and conceptual development, including measurement and semantics, and understanding causal relationships and increased use of longitudinal studies. Aguinis, at al. call for more multi level research which integrates "theories that explain phenomena at the individual or group level of analysis, with theories that explain phenomena at the organisational level of analysis to create a grand organisation and management theory" (Aguinis et al., 2011, 396), and hence bridge the macro and micro divide that has developed in management research due to researcher and journal specialisation, and which may, they claim, have led to a further "science - practice" divide in which practitioners want to solve problems at all levels and contexts and find single domain research lacking in relevance.

Hill, et al. (1999) note the bias towards research into narrow and theoretical Operational Research type problems in OM in an isolationist manner, rather than into whole organisations or systems. There is a requirement for research to be of practical use to managers and "which will be integrative rather than focussed on a subsystem technique" (Hill et al., 1999). Research should be relevant to the real world: "operations managers often work in a volatile environment and face unstructured problems in the real world, which cannot be modelled, but must be managed, and the aim will usually be to compromise rather than optimise" (p142).

4.6 Justification for case research

This section develops the calls noted earlier for more case based empirical research in OM, by examining in greater depth the nature and requirements of case research. There are two sub-sections; the first reviewing case based research, and its role in developing theory in OM, and the second justifying the use of a single case for research purposes.

4.6.1 Case research

Case research is the detailed direct examination of a phenomenon generally over an extended period of time. According to Voss, et al. (2002), case research has significant advantages over other research methods: it allows the formation of theory through understanding generated by close contact with practice; it is effective at providing answers to the "how", " why" and "what" questions. Where the phenomenon may not be well understood, case study is suited to "exploratory investigations" (Meredith, 1998). A case study gathers rich data within a real world context (Barratt et al., 2011), using more than one source of data and evidence (Leonard-Barton, 1990).

Case studies are not restrictive in their approach to data collection. They use multiple methods and tools to collect data which covers both context and temporal considerations (Meredith, 1998), and data may be qualitative or quantitative (Edmondson and McManus, 2007). Case research is inductive, likely to involve multiple iterations and closely connected with its data sources, and uses facts to form its theory (Eisenhardt, 1989, Voss et al., 2002). Methods can include direct observation, interviewing and data extracted from publicly available information (Leonard-Barton, 1990). Case studies are more frequently used for building theory, rather than for testing. The methodological fit is improved if predominantly qualitative studies are used for theory building, or where existing theory is "nascent" (Edmondson and McManus, 2007).

An exploratory case study can provide "novel insight", lead to deeper understanding and allows the building and development of theory (Lewis and Brown, 2012). Case research is useful in early exploratory work involving identification of variables and relationships (Voss et al., 2002). It allows for increased proximity to constructs and for the development of causal relationships (Siggelkow, 2007).

The question of achieving rigour has to be addressed in case research. Categories of achieving rigour, e.g. measurement, reliability, generalisability and validity, though obtained from more quantitative methods used in the social sciences, still have to be addressed by qualitative studies and researchers across a range of paradigms (Johnson and Duberley, 2000, Easterby-Smith et al., 2002). Although case research has the advantages of enhanced understanding achieved through depth of study and closeness, enhancing relevance, it can suffer from being difficult to achieve validity and develop good constructs (Meredith, 1998). The research and its results still need to be capable of being trusted (Yin, 2003). Voss, et al., (2002) note several difficulties likely to be encountered when doing case or field research, among which are how to establish validity and generalisability.

There are specific methods by which case studies can achieve an acceptable degree of rigour, among which are widening the range of data sources, triangulation and using logic to determine relationships, and detailed observation, often over a long period of time (Meredith, 1998, Voss et al., 2002, Hill et al., 1999).

4.6.2 Justification for single case

Single case studies can be particularly useful for the early stages of theory building. The single extensive case study is appropriate for new exploratory investigations (Meredith, 1998) and despite its limitations the level of description of an operation revealed by a case study enables a good basis for deriving theory (Lewis and Brown, 2012).

A single case study has significant advantages in achieving depth of observation. Given resource constraints low numbers of case allows for both more depth and longitudinal studies which are valuable in identifying cause and effect (Voss et al., 2002). Such a single case study can record in detail the operations within a single organisation (Hill et al., 1999).

There is the obvious problem of non representativeness but that might be the particular reason to select the method. OM single case studies can be influential "especially when they are purposively non representative" (Hill et al., 1999, p99), which allows for the obtaining of specific insights which might not be available elsewhere but still allow for some generalising to other organisations (Siggelkow, 2007). Although case selection is both important and difficult, selection is enhanced by finding representative cases, negative cases, or exceptional cases depending on the type of question being addressed (Miles and Huberman, 1994b).

In choosing a case research approach a trade off between depth and rigour is often observed. Although case studies are often seen as qualitative opportunities exist to capture "objective data", and case research can provide greater accuracy and reliability of data providing access to original sources and causal relationships (Siggelkow, 2007).

Case research is supported in OM and its use meets the calls for more empirical work and the development of new theory (Voss, et al., 2002). It is an empirical research method and thus responds to criticism regarding OM's over use of an analytical research paradigm (Barratt et al., 2011). It has been argued that as all OM research takes place within a given context all research is situational. "[T]he healthiest and probably the most accurate mindset for researchers is that nearly all research - whether presented in the form of large data sample analysis, a mathematical organisation model, or an ethnographic description of behaviour, is a description of a situation and is therefore a case" (Carlile and Christensen, 2004, p18).

In conclusion we can say that a single case study, with its exposure to a "situation" over an extended period of time is well supported as a method for exploratory research, and that the role of pre-existing theory in structuring the research should be to create an "open" mind able to both structure and react to developments as the research progresses (Siggelkow, 2007).

4.7 Overview of Research Design

This section sets out the research design. It is predicated on the calls for more empirical work in OM, and case studies, and in particular single case studies in which the researcher has close contact with a single operation over an extended period of time. Based on these calls for such empirical work, and the research objective of understanding the features of wicked operational problems and based on a research framework developed through our review of systems literature and systems approaches, in which system structure and system behaviour, and relationships are key elements, a broad overview of the research design is as follows:

- Identify a suitable case exhibiting significant performance problems
- Examine the structure of the operational system
- Examine the behaviour of the system
- Examine the behaviour of key elements of the system

As we have shown, case research will often use a selection of data collection methods, both qualitative and quantitative and this research will use techniques appropriate to the data and the stage of the research. Detailed descriptions and justifications for the approaches adopted will be provided in the relevant data chapters, to which we now turn.

CHAPTER 5

INTRODUCTION TO CASE

5.1 Introduction

This introduces the case study, the operational performance of the Single Payment Scheme (SPS) in England. The study was part of a larger research project carried out on behalf of the University of Exeter within the Rural Payments Agency (RPA) which administers SPS. The SPS is the means by which EU European Union (EU) subsidy payments are directed to landowners and farmers. It was introduced in January 2005, to replace most existing crop and livestock based subsidy payments. This section describes the role, function and nature of SPS within the RPA and the Department for the Environment, Food and Rural Affairs (Defra). It describes the aim of the scheme in providing payments to landowners, and uses the detailed examination conducted by parliamentary committees and external consultancies to build a picture of the challenges identified by various public bodies. It is prepared from published and publicly available information produced by the government.

This chapter is set out in the following sections:

5.2 Single Payment Scheme (SPS)

5.3 The Administration of SPS

5.4 SPS Performance and scrutiny

5.5 Concluding Remarks

5.2 Single Payments Scheme

The introduction by the EU of SPS, agreed in 2003 was intended to fundamentally reform the Common Agricultural Policy (CAP) by linking the payment of farm subsidies to targets based on environmental and animal husbandry standards, (cross compliance) rather than relating them to crops and production levels. The other aim at

EU level was to ensure that payments made were equitable across countries, and that CAP payments were controlled. Each member state could choose from one of 4 possible schemes:

- A historical or standard model, using payments received during 2000/2002 as a basis for future payments (chosen by France, Spain, Ireland, Scotland and Wales);
- A regional model using a flat rate area payment for all farms within a region (not chosen by existing member states but mandatory for all new members);
- Two hybrid models, using partly historic reference payments and partly a flat rate area payment: the static hybrid has a stable proportion (chosen by Denmark, Luxembourg, Sweden, and Northern Ireland); the dynamic hybrid gradually reduces the historical element to zero (chosen by England, Germany and Finland).

Some of the key elements of SPS in calculating payment values and meeting the environmental and welfare objectives are land entitlements, the Rural Land Register (RLR), and cross compliance. The SPS makes payments to "farmers" based on entitlement and land held, rather than on specific crop or livestock subsidies; though of course echoes of previous schemes remain in reporting and calculation of values, e.g. type of land use, some specific schemes, and livestock units on commons. The RLR set up by the RPA holds details of all registered land parcels in a digital format. This is based on Ordnance Survey information, supplemented by information gathered from farmers and land owners; from physical and remote sensing activity; and through anomalies found during claim processing. Land must be registered on the RLR in order to be eligible for payments under SPS and other environmental schemes. Among the aims of the RLR were better information for farmers and streamlined simplified claim processing. The RLR is not the same as HM Land Registry. Cross compliance is the means by which environmental requirements are met and includes the need for land holders to keep their land in acceptable agricultural and environmental condition (e.g. animal and plant health, soil structure, habitat protection) in order to qualify for the full single payment and other direct payments.

SPS is an annual payments scheme, with applications being submitted in May and June, processing from July and payments being made from December to the following June. The EU sets targets for payments to be made by specific dates. Each farmer has a unique single business identifier SBI, used to identify payees. There are numerous sub schemes, e.g. nuts, and some crops, e.g. protein crops outside the scheme. Applicants are farmers with eligible land (above the minimum size) at the application deadline, and entitlements. Land is of 3 types with different values: Severely Disadvantaged, Severely Disadvantaged Moorland, and the remainder (representing the majority of farmland).

The "farmer" does not need to be actually farming, since the aim of the scheme is merely to keep land in good condition. To ensure the RLR is up to date land is inspected physically or by remote sensing on a regular basis. The farmer must have entitlements (based on historic payments before 2005) to be able to claim which can only be activated (claimed) against eligible land. Entitlements to claim may be traded among farmers. There are specific calculation rules for common land. Penalties are levied on farmers for late or incorrect completion and applications. The rules and requirements of the scheme are sufficiently detailed for the instructions for completion to exceed 100 pages, and are replete with exactitude, e.g. stream widths are measured at their normal winter levels; and often arcane regarding eligible features, e.g. distinguishing between land covered by bracken or by dense thistle.

5.3 The Administration of SPS

The RPA was established in 2001 to be responsible for CAP payments which had previously come under the ambit of the Defra Paying Agency. It is an executive agency of the Defra, and as such is a part of government responsible to Parliament.

Its mission is "to be a customer focused organisation delivering high quality services, including processing payments and receipts, conducting inspections and recording animal identification, to government and the rural community". It has 3 strategic priorities: "customer service, effectiveness, and efficiency".[2] The RPA administers over 60 schemes including with a turnover of approximately £2bn, and manages information on more than 2m land parcels.

The RPA operates as part of the Defra "delivery network" which is made up of the core department, executive agencies (e.g. Veterinary Laboratories agency), non-departmental public bodies (e.g. the Environment Agency), Public Corporations (e.g. British

[2] http://rpa.defra.gov.uk/rpa/index.nsf/home

Waterways Board) and at the outer periphery "others" e.g. Forestry Commission. The RPA operates as an executive agency which is closest to the core.

The roles of Defra are diverse, covering areas such as the natural environment and biodiversity, sustainable development and the green economy, food, farming and fisheries, animal health and welfare, environmental protection and pollution control, and rural communities. One of its declared aims is to protect the environment for future generations, and in so doing improve quality of life, as well as supporting the farming industry.

5.4 SPS Performance and scrutiny.

Beginning with the particular choice of a dynamic hybrid single farm scheme, the early introduction of SPS, its operation by RPA and its oversight by Defra was subject to intense public, specialist and parliamentary scrutiny. SPS, RPA and Defra very quickly became the subject of detailed scrutiny by 2 parliamentary committees: The Committee of Public Accounts, (PAC), and the Select Committee for the Environment, Food and Rural Affairs Committee (EFRAC). The remit of PAC, established in 1861 is to examine public accounts and expenditure. The PAC is not concerned with policy formulation, but on value for money criteria of economy, efficiency, and effectiveness. The role of EFRAC is to examine the administration of DEFRA and its associated bodies.

The PAC examined and reported on SPS in September 2007[3], July 2008[4], and December 2009[5]. EFRAC reviewed the introduction and operation of SPS, January 2006[6], March 2007[7] and December 2009[8]. As well as the parliamentary scrutiny there is examination from other governmental and independent bodies.

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[3] Public Accounts Committee, September 2007: The Delays in Administering the 2005 Single Payment Scheme in England, HC893

[4] Public Accounts Committee, July 2008: A progress update in resolving the difficulties in administering the Single Payment Scheme in England, HC285

[5] Public Accounts Committee, December 2009: A second progress update on the administration of the Single Payment Scheme by the Rural Payments Agency, HC98

[6] Environment, Food and Rural Affairs Committee: Rural Payments Agency: interim report, HC840

[7] Environment, Food and Rural Affairs Committee: The Rural Payments Agency and the implementation of the Single Payment Scheme, HC107-I

[8] Environment, Food and Rural Affairs CommitteeDefra's Departmental Report 2009, HC121-i

The National Audit Office (NAO) reported on the administration of SPS within the RPA in October 2006[9], December 2007[10], and October 2009[11]. At the request of the NAO, Ipsos MORI conducted a survey of farmers in June 2006, and Gartner Inc. reviewed the operation and development of the IT systems within the RPA during 2007.

The October 2006 NAO report identified that the agency failed to meet its own payments target in 2005 (96% of £1.15bn paid by end March 2006); that the RPA and Defra had failed to appreciate full the risks and complexities inherent in a dynamic hybrid scheme, had no clear metrics and failed to manage either the implementation or expectations and that Defra had failed to provide proper governance. Implementation costs had escalated. They recommended that a cost benefit review be undertaken of all the components of SPS to ensure they were fit for purpose, that high risk and high value claims be reviewed ahead of 2006 to ensure accuracy, overpayments should be recovered, adequate MI systems be developed and governance improved.

The December 2007 NAO report noted that though the new management team had carried out recovery work, many of the mistakes made in 2005 had been repeated in 2006. Recommendations in this report were to continue to recover overpayments, consolidate IT systems, learn lessons from the implementation of the IT system, and to prepare adequate contingency plans for on-going partial payments.

The Ipsos Mori [12] survey of farmers' views of SPS carried out for the NAO was conducted in early June 2006 and published in July 2006, using a telephone survey of 1000 farmers, asking a range of questions covering scheme administration, contact with the RPA, consequences of timing of payments and subsequent impact on business.

60 % of respondents said that 2005 was the first year they had registered land with SPS, with a further 14% saying they registered extra land in 2005. This is in line with statements made to one of the committees about surprising numbers of new claimants and surprising amounts of land previously unknown to the RPA. 59% of respondents

[9] National Audit Office: The Delays in Administering the 2005 Single Payment Scheme in England; October 2006; HC1631

[10] National Audit Office: A progress update in resolving the difficulties in administering the Single Payment Scheme in England, December 2007; HC10

[11] National Audit Office: A Second Progress Update on the Administration of the Single Payment Scheme by the Rural Payments Agency; October 2009; HC880

[12] Ipsos MORI survey of "Farmers' views on the Rural Payments Agency's 2005 Single Payment Scheme". J27776.cgl/mkt/cjw survey farmers' views of the rural payments agency, 2006; downloaded from http://web.nao.org.uk;

found it fairly or very difficult to finalise a correct set of maps for the RLR. Only 75% agreed that their final set of maps were accurate, and of the 14% of those who signed off inaccurate maps nearly half (47%) knew the maps were inaccurate. 38% of respondents had to review 3 or more sets of maps before signing them off, making the land data liable to changes.

56% of respondents were not very well or not informed at all of the progress of their claim. Of those who contacted the RPA with a query (84%), only 55% were partially or completely satisfied or completely and only 37% in total were fairly or very satisfied with how their application had been handled. 20% thought the process should be made easier, and 22% thought that better trained and more knowledgeable staff would improve quality of service, with 17% suggesting better information. Overall 75% of farmers in England received their payments slightly (21%) or much (54%) later than expected.

5.5 Concluding remarks

There was a clear concern within parliament about the introduction of SPS. The permanent secretary of Defra noted the difficulty of understanding end to end business processes, interactions with customers, and how the scheme would operate given its many different elements. Parliamentary scrutiny had noted the difficulties being experienced and that payments were being made incorrectly. SPS was described by the PAC as a “masterclass of maladministration”. [13]

[13] A second progress update on the administration of the Single Payment Scheme by the Rural Payments Agency, Public Accounts Committee, HC 98, 16th December 2009.

CHAPTER 6

DATA ANALYSIS – SPS STRUCTURE

6.1 Introduction

We have examined systems thinking, systems approaches and their relationship to Operations Management in chapter 2, and explored the nature of wicked problems in chapter 3. In chapter 4 we justified the methodology and set out the research design and in particular the use of case studies in management research, and in chapter 5 the case was introduced, the performance of the Single Payment Scheme (SPS) within the Rural Payments Agency (RPA). In this chapter we need to begin to address our research objective, by examining the structure of SPS. We will analyse the way SPS process and information flows are structured using a standard process mapping technique, the choice of which we will justify. In line with our chosen method of examining structure and behaviour, after this chapter we move on to examine behaviour in chapters 7 and 8.

This chapter is set out in the following sections

6.2 SPS Geographic and Operational Structure

6.3 SPS Process Structure

6.4 Concluding Remarks

6.2 SPS Geographic and Operational Structure

It is useful to begin by understanding the geographic structure of SPS. SPS related activity is distributed across 6 of the RPA regional sites: Carlisle, Exeter, Newcastle, Northallerton, Reading, and Workington. A description of the particular reference activities for SPS processing is set out in Table 6.1 below. SPS related work is carried out in each site as set out in Table 6.2

Activity	Activity Description
Standard Whole Case Worker (WCW)	The WCW is responsible as far as possible for the progression of the case once the claim has been scanned into the IT system RITA; (RPA Information Technology Application). Work is based around a series of potential tasks, investigational and correctional, that arise as checking and flagging of the claim against other databases and known information. The IT system had originally been designed around a task basis in 2005, but in 2007 this was changed to case basis (although the task based processing was not similarly changed) to try to provide better continuity (over the claim year), single point of contact and perceived ownership. It is possible for the farmer to contact the Customer Service centre and then be passed to the relevant WCW for more technical queries. There is no regional or geographic allocation of SBI / farmers to WCW. Relevant claims would be passed temporarily to specialist departments (e.g. commons) but would remain the responsibility of the WCW.
Entitlement Correction (EC)	Adjustments to entitlements (where an error had been identified) can have multiple effects on back year payments and on other farmer's claims if an (invalid) entitlement had been traded. These are dealt with by specialist departments, with an emphasis on ensuring that claims remained valid.
Entitlement Transfers	The scheme is based on two principal criteria: the holding of entitlements (to payment) and the possession of eligible land. The SPS scheme allows trading of entitlements between farmers. No central database exists, so notified transfers are updated to the case file as necessary. Transfers are allowed at any time during the year, but must be held on a specific date within the claim year to be allowed for payment, if the farmer has sufficient land. The entitlement is based on pre-existing crop based payments made to farmers in 2005; the year before SPS was introduced.
Overpayments (OP)	Errors in payment to farmers, either overpayments or underpayments are dealt with on an on-going basis. Differences may arise due to misclaims, ineligible features' being identified by an inspection, or due to entitlement transfers. It is important to note that SPS is an open scheme, (like personal and corporate taxation) and an error noted may result in corrections (either under or over) to payment being necessary to previous years payments already made.

Activity	Activity Description
Cross Compliance	A key feature of the EU wide introduction of SPS was the separation of the entitlement to payment from land holding and use (e.g. crop type), and allowing the trading of entitlements. Instead there was a duty placed on the farmer to maintain his land to required environmental and aesthetic standards. This specialist team deals with regular reviews of compliance.
Physical Inspection	Carry out on farm inspections to check for cross compliance, measurements, and ineligible features.
Remote Sensing	Carry out inspection of land details using satellite and aerial imaging.
Commons	The rules for calculating payments where all or part of the claim relates to animals grazing on a common are different to the rest of the scheme. In addition to this exception processing the land database for commons is not held by RPA but by local authorities in the Commons Register.
Data management Unit (DMU)	Annual claim forms are sent to one location and DMU where they receive an initial brief validation (e.g. signed and complete) and scanned and attached to the case/SBI into the main IT system, RITA.
Customer Registration (CReg)	Customer registration is responsible for receiving new customer applications, allocating SBI's and maintaining customer data, and dealing with deregistration (either voluntary or through death) and probate.
Cross Border	The English SPS is significantly different and more complicated than the Scottish and Welsh versions. Farmers whose claims contained cross border holdings are dealt with by a specialist team.
SMU	SMU is responsible for overall management of SPS, and resolving detailed technical queries and ensuring that decisions were adequately communicated to ensure consistent national treatment.
Rural Land Register (RLR)	The Rural Land Register (and associated database) holds details of land ownership and type / layout down to field name and size across England. It is maintained through farmer notification and inspection.
Inspectorate (CMT)	Responsible for management of central and local inspectorate teams, who also had jurisdiction over other schemes within Defra not included in SPS.
Finance	Make payments, maintain batch control and perform quality checks, and are responsible for overall scheme accounting.
Policy Scheme Management Unit (PSMU)	PSMU are responsible for dealing with policy matters, including liaison with DEFRA and EU, and interpretation of national or international schemes.
Customer Services Centre	The Customer Services Centre is the initial point of contact for farmers wishing to contact the RPA/SPS. Simple queries are dealt with directly; more technical issues may be passed to WCW.

Table 6.1 SPS Activity Description

Set out below in Table 6.2 are details of the geographic split of SPS activities

	RPA geographical location					
Activity	Carlisle	Exeter	Newcastle	Northallerton	Reading	Workington
Standard WCW	Y	Y	Y	Y	Y	Y
Entitlement Correction (EC)	Y	Y	Y	Y	Y	Y
Entitlement Transfers			Y			
Overpayments (OP)	Y	Y	Y	Y	Y	Y
Cross Compliance	Y					
Physical Inspection	Y					
Remote Sensing	Y	Y				
Commons		Y		Y		
Data Mgt. Unit (DMU)			Y			
CReg		Y				
Cross Border				Y		
SMU				Y		
RLR					Y	
Inspectorate (CMT)					Y	
Finances					Y	
Policy SMU					Y	
CSC						Y

Table 6.2 Geographic split of SPS activities

Based on our initial examination of SPS within RPA we identified the following relational activity flows between sites. The functional (geographical and departmental) model showing necessary flows between sites and activities is set out below in Figure 6.1.

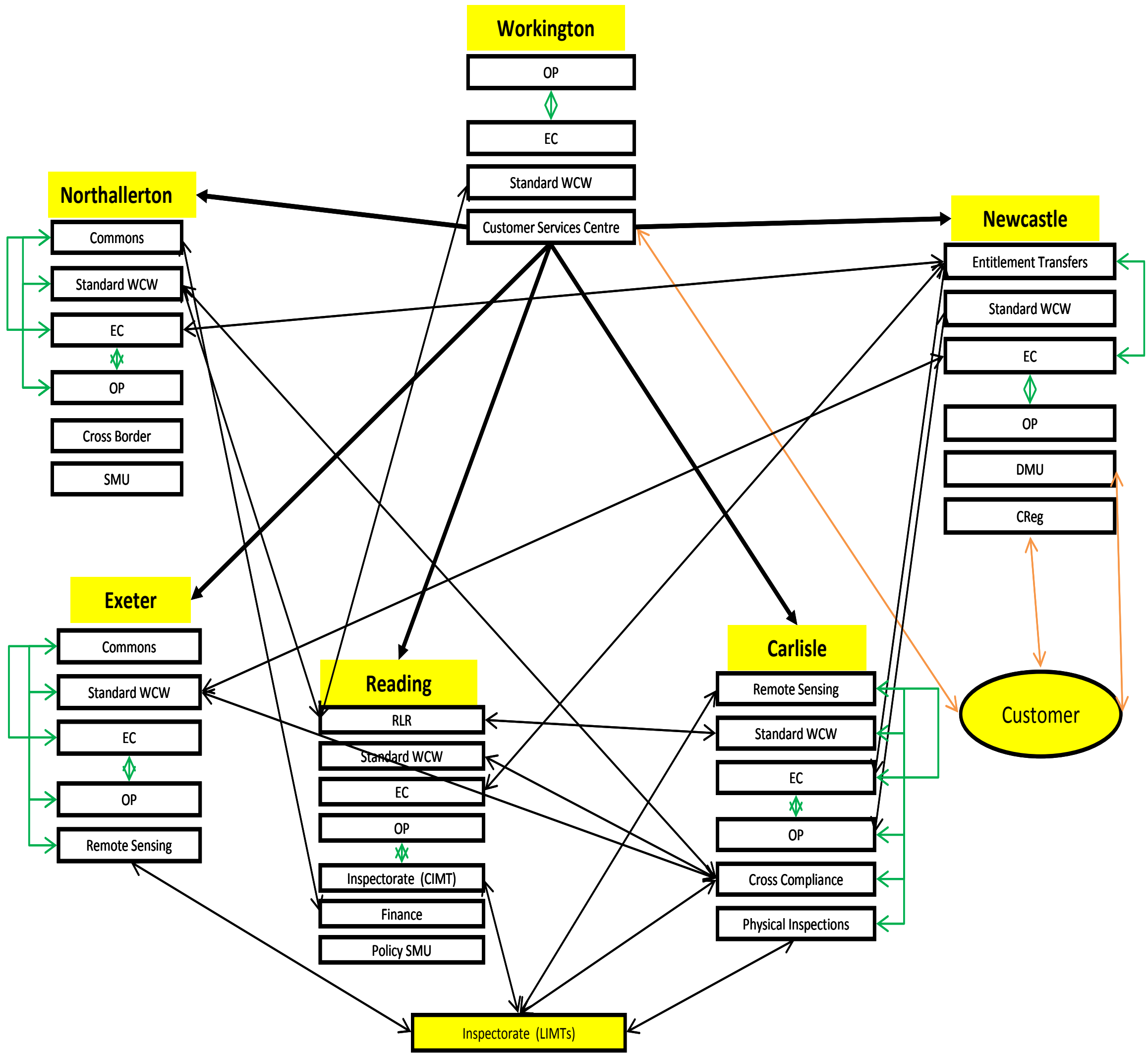


Figure 6.1 Geographic map of SPS locations and activities

The model shows the information flows between the 6 sites and the customer. It is apparent that there are a large number of cross linkages along which information can flow between the sites as set out in the Table 6.3 below.

	Reading	Northallerton	Exeter	Workington	Carlisle	Newcastle
Reading		2	0	2	2	1
Northallerton	2		0	1	1	1
Exeter	0	0		1	1	1
Workington	2	1	1		1	1
Carlisle	2	1	1	1		2
Newcastle	1	1	1	1	2	

Table 6.3 Cross linkages between SPS locations

The current physical design of SPS shows many interconnections and hand-offs, with significant replication possible as demonstrated by the multiple loops a claim might make between departments and sites before being completely processed, denoted by the arrowed lines in Figure 6.1

There is a mix in each site and between sites of generalist and specialist, with specialists being concentrated in individual sites e.g. each sites has WCW's, but cross border work is only done in Northallerton, Commons work is only done in Exeter and Northallerton, and cross compliance is only done in Carlisle.

Customers can only contact two sites directly: Newcastle where the annual claim form is sent; and Workington where the Customer Service Centre is located. Although each site has drop in centres for farmers to leave their application formwork, no checking is done with the farmer present and no assistance or advice is given.

Each site is performing entitlement correction and overpayments processing, indicating the importance and frequency of this type of work.

There is apparent disconnect between departments, functions, functionalities and employees: handovers of cases are blind, with processing history and data reliant on the IT systems. Whilst the locations are geographically dispersed this does not seem to have been as a result of a strategy of moving closer to the customer.

This structural analysis is not however a description of the processes supporting the transformation which we now need to explore. We will consider firstly how we are going to model the processes, rather than as above describe geographical location and functional specialisation and departments. This will require a robust modelling method which includes the whole system and the processes forming it, with a clear exposition of the relationships between them.

6.3 SPS Process Structure

6.3.1 Representation of Processes

An organisation is an open system with a permeable boundary to its environment across which inputs and outputs flow, and which transforms inputs (Katz and Khan, 1966). It is the processes within an open system that carry out this transformation. Organisations are processing systems and within the whole organisation the operations area is also a system (Rummler and Brache, 1995, Slack et al., 2005). The question as to where the boundary is drawn between an organisation and its operation, and between a system and its processes is largely dependent on the viewpoint of the observer (Checkland, 1999). Business processes consist of a configuration of resources, which transform inputs into outputs and are contained within the operational system (Slack et al., 2005).

Process mapping is an accepted method for the examination of efficiency and effectiveness of an organisation, and the recording of its processes (Biazzo, 2000). A process map takes procedures and practices and converts them into a picture which shows the routes inputs take to become outputs and show the functions / departments involved and the hand offs with connecting processes. It can highlight areas where performance is deficient and hence trigger ideas to improve process (Anjard, 1996). This pictorial description may choose different perspectives to focus on; for example functional (elements of the process), behavioural (when and how), organisational (where and by whom activities are performed) or informational (structure and relationships of information flows) (Biazzo, 2002).

Hensley and Utley suggest an important representational layer between the "system" and its "processes" is that of "configuration". They state that an important factor in system performance and service reliability is the way the processes are put together to form the system (Hensley and Utley, 2011). They cite as examples parallel or serial or hybrid possibilities (Buzacott, 2000). Clearly the larger the system and hence the greater the number of the processes the larger will be the possible combinations and the more complicated this configuration could be.

It is possible to link this “configuration” level to “structure” in our analysis. Using their 3 level framework (of system, configuration and process) they suggest that each level would have its own natural set of tools for recording them and to ensure and measure performance and ensure reliability. These tools according to Hensley and Utley, arguing from within a functionalist viewpoint naturally fall into 3 broad types: quantitative, preventative and pictorial.

The quantitative tools are failure rate analysis, (a single point in time measure of performance), and statistical process control, (showing performance over time/ time series data) and specifically if the process is in statistical control (within limits) or not. Each of these 2 tools may be used for single processes or sub systems, or a number of processes at systems level (e.g. using multi stage control charts). The Pareto technique is semi quantitative, used to measure and identify where failure is being cause by a small number of causes within a system.

Preventative tools such as poka yoke or standards e.g. standard operating procedures tend to be operated at process/activity level, while at the system level Hensley and Uttley suggest Failure Mode Effect Analysis, (FMEA) tends to be more applicable. For the pictorial tool set, they suggest process mapping at the configuration level, e.g. flowcharts or blue prints, while at the systemic level Root Cause Analysis (RCA) and fishbone diagrams are suggested both of which can be used to identify causes of systemic error or service failure. Only pictorial tools are suggested as appropriate for the structural / configuration level.

An overview of the tools and their suggested applicability is set out in Table 6.4 below.

	Organisational Level of Tool Application		
"Tool" Type	"Sub system / process"	"Configuration"	"System"
Pictorial		Process Maps Flow Charts Service Blueprinting	RCA Fishbone Diagram
Quantitative	Failure Rate Analysis Single Stage Control Charts		Multi stage failure rate analysis Multi Stage Control Charts Pareto Analysis
Preventative	"Failsafing" Standards		FMEA

Table 6.4 Comparison of analytical process recording tools (based on Hensley and Uttley, 2011)

We accept that there are other ways to record organisational structure and to understand organisations from other epistemological viewpoints (Biazzo, 2002), and that there are concerns over the use of process mapping, in that they ignore the social dimension of organisations, (Aldowaisan and Gaafar, 1999, Trist, 1981), and are essentially static depictions. However when attempting to analyse the technical nature of the organisation within which the social actors operate, process mapping supports a viewpoint that is oriented to the needs of the customer and operational performance in terms of cost time flexibility and quality objectives (Biazzo, 2002).

6.3.2 IDEF mapping theory and data collection methodology

Smart et al., (1997) reviewed modelling techniques to determine how well they met a set of necessary requirements of system modelling. Reviewing Petri nets, action workflow, IDEF0 flowcharts, role activity diagrams, object oriented models, and data flow models, they concluded that IDEF0 is the best technique for modelling systems.

IDEF0 (Integrated computer aided definition method) is part of a comprehensive suite of tools with IDEF0 being widely used in process mapping (Fulscher and Powell, 1999, Aldowaisan and Gaafar, 1999). It uses a highly structured framework to draw logical process maps to any level required. Processes are reconstructed through interviews and author reader review cycles and thus based on retrospective rationalisation by actors of their activities (Biazzo, 2000).

Its basic feature is a simple but consistent syntax for describing and showing the transformation taking place, the resources needed to carry it out, and the rules governing the activity. The 5 descriptors are input, activity, output, mechanism (resources) and control (rules). The four elements that relate the activity are collectively known as "ICOM".

These are combined in the following simple repeating diagrammatic model set out below in Figure 6.2. Each ICOM diagram has a simple consistent definition:

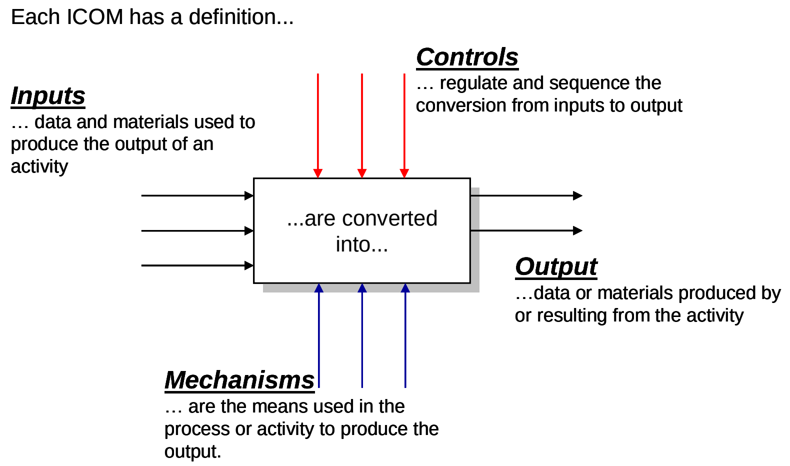


Figure 6.2 IDEF process map ICOM pro forma

There are a number of significant advantages to using IDE0 as a modelling technique. The basic syntax and diagram is a constant, and rules limit the number of ICOM activity diagrams on a page (hierarchical level) to between 3 and 6. A strict hierarchy is enforced: each diagram on a level can be decomposed to between 3 and 6 sub activities. During such decompositions ICOMs on a lower level must be represented on a higher level, ensuring completeness. IDEF0 distinguishes between inputs (the "things" that are being transformed) and mechanisms (the "things" doing the transformational activity). Labels can be attached to input output arrows describing the noun that is being transformed, and activities must be phrased as verbs.

Data for IDEF0 modelling is collected through a process of semi structured and structured interviews using the ICOM diagram as a template. Significant representatives in the process are interviewed; these can range from senior management through middle management to operatives. The interviewing process is designed to gather detailed descriptions of what people do and the processes they operate and manage. Subsequent to the interview using notes gathered, local operational maps are drawn which are then subsequently represented to the original interviewee for correction and validation.

The various local maps are then combined centrally to build the overall Business Process Architecture (BPA). This shows how all the various local processes interact and the commonality and differences between them. The level of abstraction is inevitably higher than the local maps, and is designed to show a complete picture of the organisation highlighting the end to end flows (from customer need to customer satisfaction) more clearly. In effect a systems model is created, through combining and abstracting from lower level detailed fact based descriptions, allowing a whole organisation picture to emerge. It can be seen that the IDEF0 descriptions meet the description of systems and processes discussed earlier.

Rigour is attained by the use of an accepted standard methodology of process mapping, the use of multiple interviewers, and the interviewee reviews. We ensure triangulation through the use of a multiplicity of data sources. Results were also the subject of ongoing reviews by local and senior management.

6.3.3 SPS Business Process Architecture

At SPS the standard process as described above was performed over a period of 4 months using a team of 4 people using the above interview – review technique. The top level process map for SPS is set out below in Figure 6.3.

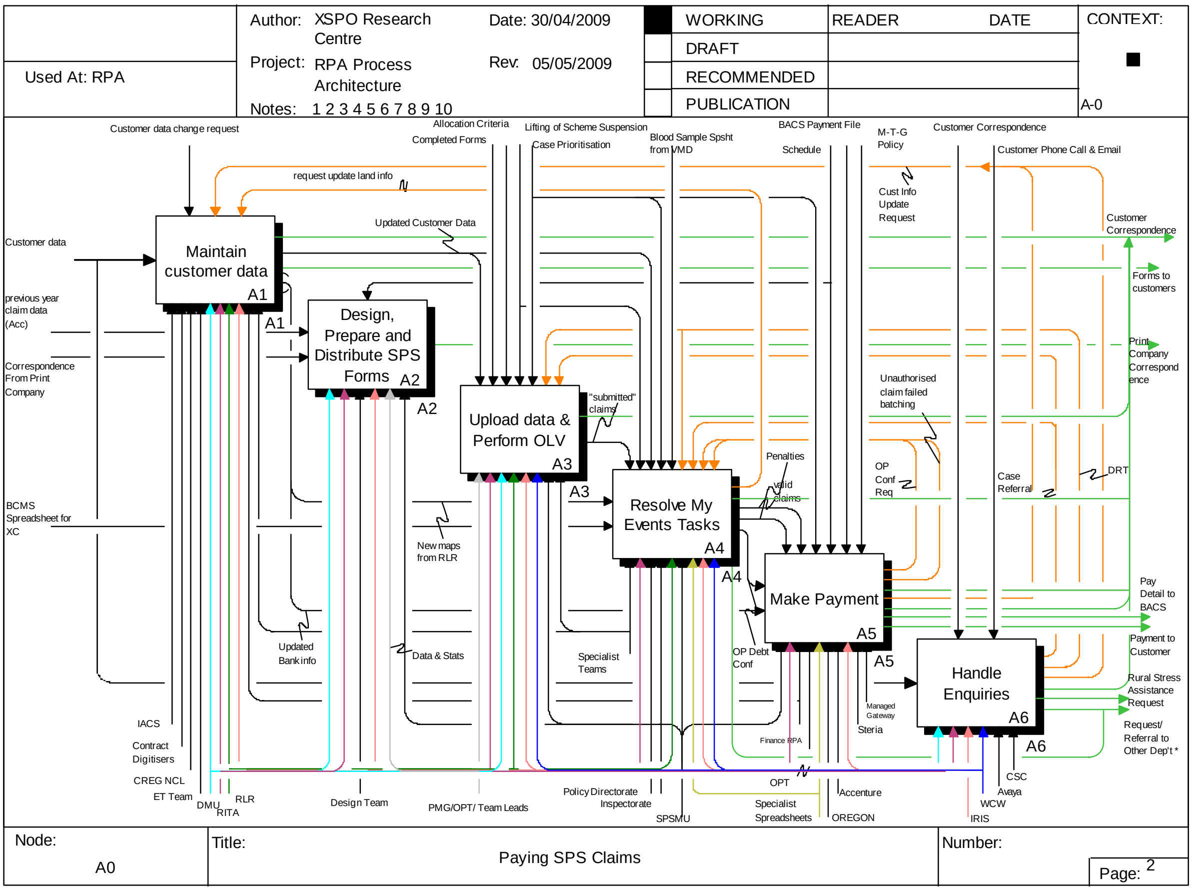


Figure 6.3 SPS Business Process Architecture

A complete set of IDEF maps for SPS describing the BPA is set out in Appendix 6A

6.3.4 Analysis of SPS Business Process Architecture

The purpose of the model is to describe the system for receiving, checking and paying SPS claims bounded by a customer input and payment to customer. We identified the following 6 key activities within SPS in transforming the information about a farmer, farm and the data on the claim form into a valid timely and accurate payment:

- Maintain customer data;
- Design, prepare and distribute SPS forms;
- Upload data and perform OLV (on line validation);
- Resolve My Event tasks;

- Make payment;
- Handle enquires.

These are explained in more detail below but it is worth noting the following: 3 of the 6 processes affect customers directly, while 3 are more internally focussed. At this level of decomposition of the BPA in Figure 6.3, no detail is really given as to what is happening at lower levels, but the flow of information through SPS and its transformation from claim to payment is clear in boxes A3, A4, and A5. The customer / farmer appears at each end of the flow and is always principally in focus with respect to what might be referred to as his standing data (personal and property), and transaction data (annual claim). A considerable amount of internal jargon is included, partly to make the diagram more accessible to an internal reader; the diagram has not achieved a pure level of abstraction at this point.

This top level diagram shows that here are many feedback loops between activities, a multiplicity of mechanisms both human and IT related systems, and that many of the mechanisms are outsourced beyond the agency boundary.

We will now examine the next level of decomposition of these 6 activities. References to double digit codes, e.g. A11, may be found in the detailed maps set out in Appendix 6A.

- A1. Maintain Customer data. Registering new customers and updating existing customer data is done by the customer completing forms, letters etc., (A11, A12) which are then input by the WCW to the main customer recording and transaction IT system, known as " RITA". Customer registration may also need to be cancelled and probate enquiries dealt with (A14). Each customer is allocated a unique Single Business Identifier under which all his particular entitlements and land holdings are grouped; these can be amended if necessary (A13).

  Some customers may hold land not much larger than a pony paddock, whilst others e.g. National Trust or the Co-operative Society hold significant and widely distributed land and entitlements. The minimum land area for a claim is 1 hectare (100m x 100m), and for a valid land parcel is 0.1 hectare. Maintenance of land data e.g. farm size, field size, ineligible areas (e.g. ponds) is done by specialist internal and external teams, and held on RLR and RLE1 databases, which are separate from RITA, the transactional system (A15). Each of these are on-going activities with no annual or periodic timetables.

- A2. Design, prepare and distribute SPS forms. SPS claim forms for all applicants are distributed annually. The form can change its design from year to year, based on scheme changes, and feedback from WCW's and claimants (A21). The claim form is prepopulated (A22) by previous year's data held on RITA, the main IT processing system at a specific date some 3 months prior to distribution. The intention is that if no changes are required the form is reviewed and signed by the claimant and returned. Changes need to be made on the form manually by the farmer or his agent. Changes may relate to changes in land ownership or use, changes in ineligible features, possibly as a result of an inspection, changes in the amount of entitlements available to the farmer, or changes in the amount of entitlement that the farmer wishes to activate in this particular claim. The farmer cannot claim entitlements greater than available eligible land, but may choose not to activate (claim) all their entitlements if they choose not to. Forms are printed and distributed by an external provider.

- A3. Upload data and perform OLV (online validation). Signed (and amended by the farmer if necessary) forms are received within a specific time window, and scanned by Data Management Unit (DMU) with the scanned images ultimately passed to the RITA IT system.

  Returned forms are initially manually checked for completeness (A31) prior to being uploaded through scanning to RITA by DMU (A32). Once uploaded and deemed satisfactory for further processing the DMU cleared claims (approximately 120,000) are allocated to various RPA sites and individual WCW's on the basis of previously decided allocation criteria (A33).

  These allocation criteria are likely to change annually, meaning that claims are likely to be dealt with by multiple sites and WCW's over their lifetime. The final stage of this section is for allocated claims to be passed to on line validation where the claim is checked by a W.C.W and specialist teams for correction prior to becoming a valid "submitted" claim (A34). Exceptions at any point may result in correspondence or other customer contact, and further necessary correction work.

- A4. Resolve my events tasks. Submitted claims are then processed through RITA; error conditions lead to a task (known as a my event task) being automatically raised as a result of checks carried out by the IT systems, which requires manual intervention for its correction. Some claim forms will pass straight through this stage of processing with only very limited manual intervention. Tasks may be standard or specialist (A41 and A42). Specialist claims may for example involve land holdings on commons and cross border land and inspections which will be dealt with by specialist teams but will be then returned to the allocated WCW for completion of any other tasks.

  A proportion of claims are subject to a land inspection by a specialist team of inspectors to ensure that incorrect claims are not being made. Reports are returned which may result in the claim for the current year and earlier years being adjusted either upwards or downwards with the possibility of penalties being raised for incorrect claims (A43). Periodically, new maps are produced for all claims by RLR teams. SPS allows for trading of entitlements which may result in corrections being required (A44). Previous calculation and payment errors may be adjusted for at this stage (A45). Once all tasks have been completed the claim is passed for payment.

- A5. Make Payments. Claims are paid (A53), but according to a certain timetable within the payment window, and potentially subject to reduction due to penalties. Valid claims are batched and passed from RITA to the payments IT system Oregon (A51 and A52), which is administered by Finance. Specialist teams are also responsible for recovering any necessary overpayments or adjusting for underpayments (A54), which may have arisen in current or previous years. Necessary quality checks and reporting are performed (A55).

- A6. Handle Enquiries. Enquiries are received (A61) in the form of letter, scanned (A62) before actioning, emails and phone calls. They are dealt with by WCW's who seek first to understand the problem (A63), and then resolve it

(A64). Relevant databases are updated (mainly RITA) or departments informed as appropriate. Some actions will require correspondence to the farmer (A65).

In addition to the information contained within the BPA, other data was gathered during the interview and mapping exercise concerning the performance of SPS; these are set out below.

6.3.5 Other findings

During the process of collecting configurational data through interviews and observations, we were also able to collect related information on more general issues affecting processing performance that might not be represented in the process maps. The mapping team identified the following four performance related issues which are summarised as: "Batch of one"; Error correction; 100% accuracy; Workaround processes.

1. Batch of One. Because of the design of the scheme in which a fixed amount of EU funding is distributed to an initially unknown amount of claimants and total of claims, it is not possible to make individual payments until all the claims have been processed and validated, and an annual valuation exercise undertaken. Hence no payment can be made until all claims have been validated and passed for payment. All the claims are linked together and are, in effect, a batch of one. This condition is exacerbated by the interrelated nature of the claims, where the information on one claim, or a correction on that claim, will affect another claim. Such circumstances can be caused by geographic boundary changes, entitlement trading, and commons calculations. Thus it is possible and indeed is frequently the case that a claim that has been validated and passed for payment can be returned for further processing and correction if further errors potentially in other claims, are indentified.

2. Error Correction. It became apparent during interviews and subsequent reviews that the majority of effort expended in SPS, both by staff and IT systems was consumed by the correction of errors to allow a claim to pass to payment. This error correction activity occurred at all stages within the process. Although most claims processed satisfactorily a significant minority required considerable amounts of rework prior to passing for payment. Owing to the batch of one issue noted above, this had the potential for causing delays in paying correct cases. More importantly, judging by the evidence of resource consumption and RPA targeting, SPS had changed its primary task from that of making payments to one of error correction.

3. 100% accuracy. This change was exacerbated by the RPA focus on 100% accuracy, where a focus on error identification led to more errors being identified and requiring correction and thus more resource consumed. The attempt at 100% accuracy was hampered by, inter alia, unreliability and instability in base data. Both the claim form and data used to validate it could contain errors which might not be identified until late stages in processing.

4. Workaround Processes. Although little discretion was allowed to individual operators and departments, it was noted that rigid standardised processes were being circumvented in some departments by workaround processes and spreadsheet computing. This rigidity also meant that all claims had to be treated in the same way, including those relating to high profile large landowners e.g. Co-Op and National Trust; the absence of a separate treatment strategy of large multi-site landowners on a large scale created processing problems.

6.4 Concluding Remarks

This chapter has described the structure of SPS and conveyed the complexities involved in managing the scheme. We reviewed the physical and operational structure of SPS by analysing the work carried out in and the connections between the various geographic locations of the RPA in which processing is performed. A Business Process

Architecture was created using a process mapping technique, IDEF0, showing the process structure and associated information flows.

The distributed geographic nature of SPS requires a large number of processing hand offs, and leads to different procedural approaches and multiple claimant touch points.

The operational design of SPS and scheme choice leads to a number of different IT systems, required to manage processing, and hold customer, land and entitlement data which need to interact smoothly to support processing. These include departmental systems which may duplicate other systems or contain different information.

Processing does not follow a linear structure but has many recursions. There are a significant number of flows that loop back to other activities and between functions. These loopbacks often involve the correction of errors required to progress payment.

The further need under scheme rules for 100% accuracy contributes to this reprocessing, as errors and changing information due to changes in base data are identified in later stages of the process.

Claims are connected to each other through the sale of land or entitlements. The requirement for an annual valuation exercise connects all the claims together during the later stages of processing.

Having reviewed the structure of SPS processing we shall now examine the behaviour of processing in the next two chapters.

CHAPTER 7

DATA ANALYSIS: CROSS SECTIONAL

7.1 Introduction

We have determined in chapters 5 and 6 that the performance of SPS is unsatisfactory, and that the geographic and process structure, and operating processes are complicated and highly connected. We now need to determine what is causing this level of performance by examining the behaviour of SPS, over a completed claim year. This represents a cross sectional analysis.

This chapter is set out in the following sections:

7.2 Methodology choice

7.3 Root Cause Analysis

7.4 Data collection

7.5 Data results and analysis

7.6 Concluding remarks

7.2 Methodology Choice

The choice of method will depend in part on the location of the problem in terms of analytic techniques. As described in chapter 2, Weinberg (2001) identifies 3 “number zones”, which have different qualities and requirements in terms of appropriate analysis tools. In large number zones statistical analysis can be used to identify cause and effect on populations, rather than individuals, and here the methodology of surveys can be used. In small number zones, where interrelationships are weak, mathematical /axiomatic representation and modelling can be used. In medium number zones, where effects are complex and not necessarily random, and there are strong interrelationships between the elements, case studies and their refinement, action research, are often used. This is the appropriate level for this research. It is therefore appropriate that we continue to use tools appropriate to this level. This necessarily involves taking a qualitative rather than a quantitative route.

We determined in chapter 6 to use a pictorial and diagrammatic route in the study of SPS. Root cause analysis (RCA) continues that route and is suggested by Sutcliffe as being appropriate for this type of research (Sutcliffe, 2005). Although identifying simple single cause and effect is fairly straightforward and tools such as simple problem solving, trouble shooting, and applying fixes can therefore be used, SPS is a more complicated problem. RCA is a more extensive and rigorous type of analysis (Finlow-Bates, 1998), and has been described as a small case study (Wald and Shojania, 2001). We have chosen to use RCA as our method for identifying the causes of poor performance in SPS.

7.3 Root Cause Analysis

7.3.1 Introduction

Root Cause Analysis (RCA) is an established method and tool developed for use in an industrial environment, and is being used increasingly in service environments for the review of adverse events, investigation and subsequent prevention. It is widely used in accident investigation in plant and transport incidents, healthcare, software development, and process industries such as petrochemicals (Rasmussen, 1990, Reason, 2000, Vincent et al., 1998).

It is a structured analytic technique for identifying the particular underlying causes, (the how and why) of performance problems, which then aims to prevent further unwanted events (Doggett, 2005, Rooney and Vanden Heuvel, 2004). Its aim is to find the cause which is within management's control to resolve (Iedema et al., 2008). Such causes may appear in combination (Latino, 2004), and RCA tends to look at failure, rather than good performance (Leszak et al., 2002). RCA may reflect a picture which includes multiple, related and dynamic causes (Vincent, 2004).

7.3.2 RCA methodology

RCA techniques are used on a number of event types, ranging through catastrophic accidental events (Reason et al., 2001), adverse egregious events, particularly in a medical setting (Doggett, 2005), to similar frequent, but less life threatening, events, such as software development (Card, 1998). The existence of an error event is an inverse of reliability as a measure of performance (Reason 2002). Errors also tend to group into types with "consistent patterns" (Reason, 2000, p769).

The rationale of RCA is based on the assumption that for each event there is an identifiable root cause or collection of causes (Iedema et al., 2008). There are a number of pragmatic ways of identifying this root cause, based on cost of enquiry or intervention, and ownership and control (Finlow-Bates, 1998). A root cause is considered to be one that can be controlled by management (Rooney and Vanden Heuvel, 2004).

A key feature of RCA is that the cause will not be random chance, but will be attributable to an act or a series of acts. These acts (of commission or omission) can be attributed either to "people" or the "system" within which they are operating. Each approach has a different model of cause and effect and hence management approach (Reason et al., 2001). There is a natural tendency to identify proximal causes and blame individuals. However, blaming an individual isolates the error from its system context (Reason, 2000). In the systems approach the expectation is that humans are fallible, errors are to be expected and are consequences not of human nature, but systemic factors. Interventions are to be based on the conditions under which people work. The purpose of RCA is to identify system errors and avoid personal blame (Wald and Shojania, 2001). It is assumed that the removal of errors will improve performance reliability (Card, 1998).

There a number of limitations surrounding the RCA method which are: its qualitative nature, in which it has been likened to a small case study (Latino, 2004); the application of a stopping rule when forming a conclusion about cause, leading to concerns about the completeness of the identification of conditions and causes (Iedema et al., 2008, Gregory, 1993); the potential for bias in cause selection (Reason et al., 2001), and applicability across sectors and event types (Hofer and Kerr, 2000, Vincent et al., 1998).

The activity steps in performing an RCA derived from the literature are as follows:

Key activity step	Commentary
Identify the problem to be analysed	This may be an egregious or sentinel event, or a sample from a larger population; (identifying the wrong event will lead to the identification of the wrong cause and wrong corrective action)
Collect data about the event using a multidisciplinary, dedicated team	Complete information provides a better understanding, and data collection performed in a disciplined manner helps support identified relationships and sequences, and timelines. The use of a multidisciplinary team increases validity as it encourages corroboration, triangulation and idea generation.
Analyse data to identify and classify problems and causes	Determine how and why the event occurred. Identify and classify systematic (likely to be repeated) errors using a framework, which may be predetermined or generated during the exercise; collect more data if necessary as the identification of causes develops.
Determine principal cause	Identify the cause effect relationships that combined to produce the outcome
Develop action proposals	Develop recommendations for corrective actions for each root cause identified and for preventative counter measures; this may involve redesign...
Communicate Findings	Report Findings in order to share learning
Implement Proposals	A key element of the RCA is the improvement of performance and prevention of recurrence

Table 7.1 RCA procedural steps (Based on (Latino, 2004, Card, 1998, Rooney and Vanden Heuvel, 2004)

Dogget (2004) identified from an extensive literature review three techniques as generic standards for identifying root causes: these are cause and effect diagram (CED), inter relationship diagram (ID), and current reality tree. In an empirical test he found the CED to be better than the other methods for identifying and confirming cause categories, with the ID and CRT requiring considerable technical expertise (Doggett, 2004). We have chosen to identify cause of poor performance in SPS using a CED approach and set out our method of data collection and analysis in the following sections of this chapter. The next section 7.4, deals with the CED methodology for SPS, and the data is set out in section 7.5.

7.4 Data Collection

7.4.1 Introduction

Having chosen to perform a Root Cause Analysis in order to understand the behaviour of SPS and to seek to identify causes of poor performance, and chosen to portray this using a CED this section sets out how the diagram was constructed and populated for SPS. It details the exact method used, and the ways in which our method departed from usual traditional ways of completing a CED to make the approach more rigorous, with respect to some of the critique points set out in the earlier section.

7.4.2 Method for completing the Cause and Effect Diagram

The key steps in our adopted modified method were as follows:

1. Formation of three multidisciplinary expert teams
2. Identification of error type conditions
3. Identification of cases/error occurrences for review
4. Creation of cause effect diagram
5. Data collection to complete the CED

7.4.2.1 Multidisciplinary teams

The 3 multidisciplinary teams consisted of:

- A design/assurance team formed of representatives from Exeter University, RPA Internal Audit, and a Specialist IT Strategic Consultancy, with experience of RPA and SPS.

- The second team was formed of 10 experienced whole case workers (WCW), responsible for processing claims, supervised by a further more experienced WCW.

- The third team (“expert panel”) was formed of 6 mid-level managers from various departments and functions within RPA, responsible for SPS processing and management, each of whom had detailed working knowledge of SPS. These departments were Operations, Business Development, Joint Solutions Architecture, Scheme Management Unit, and Accenture (responsible for IT systems).

The roles of each team are set out in the relevant sections below.

7.4.2.2 Identification of error type conditions

Evidence gathered during our process mapping suggested that approximately 20% of claims in any one year could be described as being in an error condition, but we noted that existing internal documentation such as the various scheme control and quality plans were only of limited use due to insufficiently clear definitions of consistency timeliness and accuracy at claim level for detailed analysis, and absence of any adequate relevant systems data.

A desk review was undertaken of all completed cases in the 2008 claim year (at the time of our study covering 2009 and 2010 this was the most fully completed claim year), enabling the determination of fate and status. This involved a series of empirical analyses interrogating databases (conducted by RPA staff); the scope was from receipt of claim up to it being passed to Oregon database (RPA finance system) for payment (i.e. activity sets A3 and A4 in the Business Process Architecture (section 6.3.3).

This examination of the detailed data led to the creation of categories of anomalies. We were selecting for two types of anomaly: those claims which were clearly in error having missed a clear measurable target, e.g. late or wrong, and those which had anomalies attached to them e.g. an unexpected amount of effort had been expended in their processing, they were in appeal, or had been out sorted for offline or specialist processing.

Key definitions were needed were for accuracy and timeliness. It is important that SPS is processing and paying the “right” amount, for which we set the definition as: making one payment per authorised claim, requiring no further correction. Timeliness was defined as making payments before the relevant annual EU deadline. A correct payment was defined as having been paid once and without further corrections. Successful processing was defined as one claim payment.

2008 claim data showed that approximately 79% of claims by value and 83% by volume were paid once and within 2 months of the opening of the payment window. A further 11% by value and 7% by volume were paid by the final EU deadline. 98% of claims by value were paid within the EU deadline. 2% of claims by value and 3% by volume were paid late i.e. after the EU deadline for 2008.

A full list of anomaly conditions is set out below: categories of anomaly show value and volume as appropriate

- Multiple payments 9.9% by value
- Late payments 2% by value
- Potentially unnecessary work 11.3% by volume
- CSP/CRU cases 22% by value, 2% by volume
- Appeals 1.9% by value
- Tail Cases 1.3% by value

- Multiple payments

Multiple payments were defined as valid claims having been paid more than once. Multiple payments on a claim would indicate that the initial payment had been made incorrectly. 8% of payments by value were multiple payments (but within the EU deadline). A multiple payment indicates that interim payments or corrections are being made. Some customers were paid 4 times.

- Late payments

Late payments were defined as a claim with an element of payment after the closes of the EU payment window. 2% by value of claims were paid after the EU deadline. 0.1% were paid once, but late (and were thus deemed to be correct) and 1.9% by value were late and received multiple payments. 94% of late claims were paid multiple times indicating that nearly all of them were deemed to be inaccurate.

- Potentially unnecessary work

Potentially unnecessary work was defined as claims with inexplicably high versions and low interactions as measured by the IT processing systems, or high interactions and low versions. Work should be proportionate to the number of interactions against the case. If it were not it might indicate that work was not being carried out by the WCW correctly. Unnecessary work would consume resource that could have been used more effectively, thus potentially causing delays given a fixed resource.

Every time work is done on a case (interaction) it should be updated on RITA (resubmitted) and the version number on the system will be changed. We hypothesised that the number of versions would be related to the number of interactions. The detailed examination for the 2008 claim population indicated that this was not the case. Approximately 6% (by volume) of total claims had over 20 version changes, but fewer than 20 interactions; 5% of total had fewer than version changes but more than 20 interactions. A new hypothesis was formed that this was inconsistent with the majority of claims processes and that potentially unnecessary work was being performed (and hence resource being consumed unnecessarily) and that this was an anomaly to be further investigated.

- CSP/CRU claims

This category was defined as claims which the RPA had chosen to track in order to enhance customer interaction. High value and high profile and special cases were treated with special attention due to their potentially sensitive nature, for example they had complained, or had experienced payment difficulties in the past. In 2008 2% by volume, but 22% by value were labelled as being dealt with by either the Customer Service Programme or the Customer Relations Unit. Selections were made of cases with and without entitlement correction.

- Appeals

Appeals were defined as an instance where an appeal occurred against the claim in the 2008 scheme year. An appeal would indicate that the farmer was not satisfied with the way his claim was being handled or with its outcome. Selections were made of cases with and without entitlement correction.

- Tail Cases

Tail cases were defined as claims which were not completed in the main processing system (RITA) by the end of the payment window, and had to be processed offline manually. 1.3% by value of 2008 cases were in such a condition. Selections were made of cases with and without entitlement correction.

Having identified and agreed on relevant error conditions there was now the requirement to select individual cases for review. We identified a representative sample of anomalies in each category of anomaly from which 154 cases in total were chosen at random.

The totals in the various categories are set out in the Table 7.2 below. Further details are shown in appendix 7A.

Selection Basis	Cases Selected for Review
Late and multiple payments	36
Potentially unnecessary work	39
CSP/CRU cases	59
Appeals	5
Tail cases	11

Table 7.2 Error condition of cases selected for review

7.4.2.3 Creation of the CED

This section sets out the approach adopted by the design / assurance team in developing the CED. The initial hypotheses, based on experiences to date of the design team to be tested using the CED related to the extent that the anomalies were being caused by IT systems, data, worker skills, policy, processes, and organisation and change management.

A standard CED has four main elements: methods, machines, material, manpower, which are then used to structure elements identified during a brainstorming session in a fishbone structure , although there are many variants (Doggett, 2005). In the light of pre-existing work and experience, four key titles or themes were retained at level 1, but changed the titles to the following: Policy, Process, Organisation and Product. This selection was informed by the process mapping work developing the Business Process Architecture and experience gained by RPA Internal Audit and the IT consultancy which made up the design team.

- Policy covered the regulatory requirements, interpretation and implementation of policy, and management decisions in operating SPS processing;
- Process concerned the operational steps taken and work carried out to perform SPS processing for a claim year;

- Organisation covered the governance structure, resources, capabilities and competencies in SPS processing and introduction of change;
- Products covered the IT systems, Data, Infrastructure and supporting business products, procedures and instructions.

The aim of selecting these 4 main themes was to provide coverage both as wide as possible within the known domain and scope of the SPS, and to be as specific as possible to RPA staff to ensure ease of completion and minimum of potential training in its use. Within the scope of the case it was necessary to ensure exclusion of matters outside the control of RPA. The condition to be explored using the CED was "contribution towards creation of error". This stage of the exploration was designed to identify if possible a single cause of error, or significant contributors towards error. Details of each of the main titles are set out below.

1. Policy. This main branch concerned the introduction and maintenance of the chosen EU scheme (dynamic hybrid) within RPA; i.e. it was not concerned with the choice of scheme by Defra, but with the operation and management of the chosen scheme. The branches were

1.1. Interpretation of SPS and accreditation legislation

1.2 RPA objectives; long term and tactical; (designed to capture the potential role of management action in causing errors)

1.3 Translation of Policy (the way in which business requirements were formed and communicated to front line workers)

1.4. Interpretation of Policy by specific sites and specialisms (aiming to capture the effect of variation in which work was done locally).

2. Process. This branch repeated the IDEF0 model created in the BPA given 6 subsidiary branches, with a seventh created by splitting activity set A2, in order to increase potential understanding for the WCW's and expert panel. Level 3 branches followed from the IDEF decomposition already reviewed. The level 2 causes were:

2.1 Maintain Customer Data;

2.2 Design Prepare and Distribute SPS forms;

2.3 Upload Data;

2.4 Perform OLV;

2.5 Resolve My events Tasks;

2.6 Make Payments;

2.7 Handle Enquiries.

3. Organisation. This branch addressed the issues of skill sets and the influence of Business Change Management and the influence of external stakeholders. Level 2 causes were:

3.1 WCW skills;

3.2 Specialist Skills;

3.3 External Stakeholders;

3.4 Business Change Management.

4. Product. This section covered IT systems and infrastructure, Data, and Business Products (procedures and training materials). The level 2 causes were:

4.1 RITA and associated systems;

4.2 Off RITA systems;

4.3 Business Products;

4.4 Data.

A complete CED list is set out in appendix 7B.

7.4.2.4 Completion of the CED

Traditionally CED's are created and completed during brainstorming sessions. We did not follow this process having already pre-drawn up the CED. This pre-preparation of the CED by the design and assurance team meant that as many possible causes had been identified on a conceptual and experience basis. In addition causes could be added during the completion process if this was necessary. The CED effectively forms a series of potential hypotheses about the cause of error of a particular claim in an anomaly category. We designed a two stage testing method to check each claim against each hypothesis or combination of hypotheses contained within the diagram.

As described in section 7.4.2.1 above, two separate teams were formed from RPA staff. The first consisted of a selection of WCW's from each of the RPA locations dealing with SPS. A second team (expert panel) was formed of middle management representatives of various RPA sections dealing with SPS. The investigation method used the two teams separately. Each WCW was given a selection of cases for review and investigation. The WCW examined the detailed case records for the particular claim to identify the cause or combination of causes contained within the CED which in the opinion of the WCW had caused the case to be in the anomaly category in 2008.

The WCW then presented their analysis, to the expert panel who could examine and seek justification either from the WCW or other detailed records and either agree with the cause or set of causes proposed by the WCW or add new ones and delete others. At the end of each case review the causes identified by the WCW and amended if necessary by the expert panel were then scored / rated by importance by each of the 6 members of the panel individually and confidentially assigning a score of either 4, 3, 2, or 1, with 4 representing the most important contributory factor and 1 the least, against the level 3 or level 2 causes identified on, or added to the CED during the examination.

The case examination took place over a period of 4 days in two RPA sites in which time 121 cases were successfully reviewed by the WCW's and scored by the expert panel. Although the time to present cases to the expert panel varied, this indicates that about 30 cases were presented, discussed and scored per day, giving roughly 15 minutes per case on average for the panel review. The WCW investigation of each case prior to the panel review took on average 1-2 hours. Sufficient rigour was obtained firstly through the use of a clear investigation methodology, secondly by the extensive review process, and thirdly by the use of multiple teams to carry out and supervise the review. Results were presented on five separate occasions throughout the research to senior management.

7.5 Data results and analysis

The results of the WCW investigations and expert panel reviews are set out in 3 sections. The first, 7.5.1, sets out the data collected concerning which causes were identified during the exercise. The second section 7.5.2, concerns which identified causes were linked to which error conditions. The third section 7.5.3 analyses whether causes were liable to cluster or occur together.

7.5.1 Data Results

This section sets out the collected data on cause identification arising from the CED WCW panel review. To recap 121 cases were reviewed, the causes identified by the WCW (and amended /added to if necessary by the expert panel) were then scored by importance by each member of the panel assigning a score of either 4, 3, 2, or 1, with 4 representing the most important contributory factor and 1 the least, against the level 3 or level 2 causes identified on the CED. If the cause could not be scored at level 3, it would be scored at a higher level.

At level 1 (the 4 principal arms of the CED) the causes were scored as follows:

- Policy 18%
- Process 23%
- Organisation 24%
- Product 35%

It is immediately clear that there is no single contributory cause at level 1 to SPS error conditions.

Table 7.3 sets out a summary of the top 20 causes scored as 4 or 3, during this process which individually make up 2% or more (rounded) of the total of 4's s and 3's awarded by the review teams, using simple numerical addition. 43 causes scored 1% or more (rounded) and a further 30 scored either 4 or 3, but did not achieve 1%. This is out of a possible 95 identified causes at level 2 or 3, meaning that more than 75% of the causes within the CED were identified as being at least a major contributory factor in at least one case examined.

			Main CED arm				
CED #	CED description	Panel score	%	1	2	3	4
1.2.2	RPA Objectives - Reactive / Tactical	949	12	12			
4.4.6	Customer Provided Information	454	6				6
1.3	Translation of Policy	369	5	5			
3.1	WCW processor skills	366	5			5	
4.3	Business Products	320	4				4
3.4	Business Change Management	281	4			4	
2.3.2	Upload SPS (Form) Data	276	4		4		
4.1.4	Customer Correspondence	261	3				3
2.5.4	Correct Entitlements	258	3		3		
4.1.10	Claim Processing	246	3				3
3.2.5	EC/TEEC	196	3			3	
3.2.1	Commons	178	2			2	
3.2.13	Overpayments	176	2			2	
4.4.3	Base Data	176	2				2
4.1.9	Corrective Action Form	162	2				2
4.4.1	Claim data	138	2				2
2.1.5	Maintain land data	131	2		2		
2.1.6	Maintain Entitlement Data	126	2		2		
3.2.8	RPDE (Lux Referrals)	123	2			2	
2.8	Maintain scheme / system parameters	116	2		2		
	Other causes scoring less than 2% rounded		30	1	10	6	13
	Totals			18	23	24	35

Table 7.3 Summary of CED level 3 scores

The highest single contributory factor identified was Reactive /Tactical Objectives (1.2.2) with 12% of the total. This is considerably larger than the next highest -

Customer Provided Information (4.4.6) with 6% of the total. The third highest score was Translation of Policy (1.3) 5%, along with WCW processor skills (3.1) 5%. The next 3 causes were Business Products (4.3) 4%, Business Change Management (3.4) 4%, and Upload Form data (2.3.2) 4%.

A Pareto chart of the top 32 causes (scoring 1% rounded or more) is set out in Figure 7.1. This shows that causes identified do not follow an expected 80/20 Pareto rule. 80% of the total scores are only achieved when 50% of the causes are taken into account. This indicates again that there is no single cause or small group of significant causes responsible for SPS performance and errors.

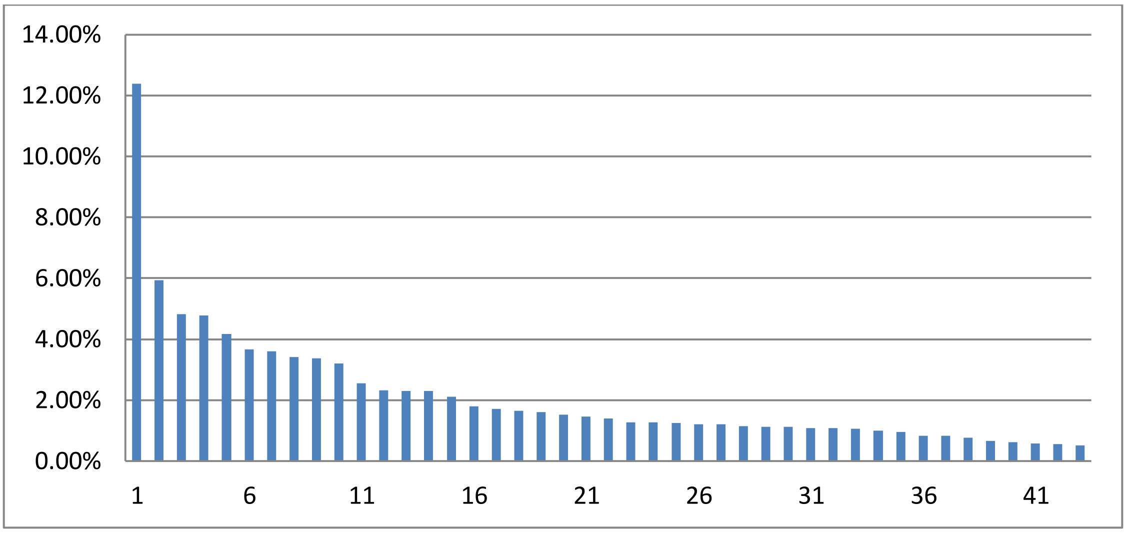


Figure 7.1 Pareto Chart of CED level 3 causes

We can further analyse the raw data by grouping lower level causes into level 2 of the CED. These results are set out in Table 7.4.

Main CED	Total %	CED #	Description	% of total
Policy	18	1.1	Interpretation of SPS and accreditation legislation	0
		1.2	RPA objectives –reactive / tactical	13
		1.3	Translation of Policy	5
		1.4	Interpretation of policy by sites	0
Process	23	2.1	Maintain Customer Data	5
		2.2	Design prepare and distribute sps forms	1
		2.3	Upload data	5
		2.4	Perform OLV	1
		2.5	Resolve my events tasks	6
		2.6	Make Payments	2
		2.7	Handle Enquiries	2
		2.8	Maintain scheme / system parameters	1
Organisation	24	3.1	WCW processor skills	5
		3.2	Specialist skills	11
		3.3	External stakeholders	0
		3.4	Business Change Management	8
Product	35	4.1	Rita and associated systems	14
		4.2	Off Rita systems	1
		4.3	Business products (procedures	9
		4.4	Data	11
		4.5	Infrastructure	0

Table 7.4 Summary of CED level 2 causes

As can be seen the single largest grouped cause at level 2 is RITA and associated systems (4.1) 14%, RPA Objectives (1.2) at 13%, followed by Specialist skills (3.2) 11% and Data (4.4) 11%. This table clearly shows the broad spread of causes attributed during the CED process.

The following causes were added to the pre-set CED during the review process: Customer Provided Information (4.4.6) 9%, Claim Processing (4.1.10) 4%; Corrective Action Form (4.1.9) 2%, Maintain Scheme System parameters (2.8) 2 %. These additions showed the strength of the CED completion process in that their exclusion from the original CED was corrected to enable a more correct view to emerge. The insertion of customer provided information ensured a full end to end viewpoint.

7.5.2 Data Analysis

In this section we examine how the attributed causes relate to error conditions. The principal causes identified during the CED review for each error condition are set out in Table 7.5 below. Full details are set out in appendix 7C.

Error condition	Principle Causes			
Multiple Payments	Translation of Policy	Commons Specialist skills	Claim processing	Customer information
Late payments	Translation of Policy	Maintain scheme parameters	Specialist skills	Reactive / tactical objectives
Change for no apparent reason	Business products	Business Change management	WCW skills	
Work without change	Customer Provided information	Claim processing	Upload SPS form data	
CSP/CRU	Reactive / tactical objectives			
Appeals	Customer Provided Information	Perform manual validation		
Tail cases	Entitlements	Specialist Entitlements	Entitlements Correction	Maintain customer data

Table 7.5 Principal causes of error conditions

The relation of error condition to cause is discussed below:

- Multiple payments

The largest causes identified here were translation of policy (1.3) 15.8%; Commons specialist skills (3.2.1) 8.9%; claim processing (4.1.10) 7.9%: and Customer provided information (4.4.6) 7.8%. Less major causes were base data (4.4.3) 6.5%; correct entitlements (2.5.4) 6.4%; maintain scheme / system parameters (2.8) 5.5%; and WCW skills (3.1) 5.4%.

Translation of Policy (the way RPA chose to implement and instruct processing) is the largest contributor. Given its organisational and process structure, and the implementation of the IT systems, SPS may be over complex and difficult to manage successfully.

- Late Payments

The largest causes identified here are translation of policy (1.3) 12.5%; maintain scheme parameters (2.8) 11.8%; Commons specialist skills (3.2.1) 11.5%; and reactive/tactical objectives (1.2.2) 10.6%. Less major causes were WCW processor skills (3.1) 6.4%; Organisation redesign (3.4.1) 6.1%; and resolve queries (2.7.4) 5.4%.

The presence of translation of policy, along with reactive and tactical objectives, again suggests that SPS may be over complex in its design to process claims effectively. The practice of prioritising and then reprioritizing certain claims over others to ensure payment by value deadlines are met may have resulted in delays to other, especially more complex, claims being late. Several claims were delayed due to rework caused by scheme parameters being incorrectly set (i.e. bank holidays) for calculation purposes.

- Change for no apparent reason /Potentially unnecessary work 1 (High versions / low interactions)

The major causes here were business products (IT systems) (4.3) 30.7%; Business Change management (3.4) 27.4%; and WCW processor skills (3.1) 15.1%. Unnecessary work has been caused by a number of factors; inadequate coordination of management of change at an organisational level has led to WCW processor skills being unable to cope with the changes. In addition the business products (IT systems) did not reflect the change from task based to case based working by inadequately supporting staff or actively misdirecting them.

- Work without material change - Potentially unnecessary work 2 (Low versions high interactions)

The major causes to this condition were customer provided information (4.4.6) 30.2%; claim processing (4.1.10) 18.5%; and upload SPS form data (2.3.2) 16.4%.

These attributed causes suggest that, as is to be expected from the design of the IT system, errors in customer provided data, or errors in uploading that data to RITA, bring about increased workloads and errors created for correction during processing.

- Tail Cases - Exceptions 1

There are a large number of causes identified for this condition, the major ones being Specialist entitlements (3.2.5) 13.4%; Entitlements correction (2.5.4) 12.2%; Maintain customer data (2.1) 10.1%; and Maintain entitlement data (2.1.6) 7.8%.

Entitlements trading and corrections work is significantly contributing to difficulties in making timely payments.

- CSP/CRU cases - Exceptions 2

The major contributor to CSP/CRU cases was Reactive/Tactical objectives (1.7.2) 83.5%. There were 6 other minor causes contributing but none above 5%. This is partly definitional, given that decisions to push cases to special treatment, for whatever reason, e.g. high value or previous year issues, is a reactive decision. It is notable that this is the main driver behind this exception.

- Appeals - Exceptions 3

The major contributors to appeals cases were ‘customer provided information’ (4.4.6) 83%; Perform manual validation (2.3.1) 10.4%; and translation of policy (1.3) 6.5%. This suggests that customer error due to confusion of misunderstanding was the significant root cause. The annual claim form often changed key data elements in its layout which may have contributed to the difficulties.

Appendix 7C sets out all the conditions and all the causes contributing over 5% of the total for that error condition.

7.5.3 Relationships between causes

We now need to examine whether error conditions in cases are caused by groupings or clusters of causes. This was done using elementary linkage analysis which uses a manual method of manipulating data to identify and bring together similar groups (Cohen et al., 2007). This technique was used to form the causes into groups which tend to occur together. The method is set out briefly below.

Causes that occur only once do not form groups, thus these were excluded from the analysis. There remained 34 causes that were referenced during the CED exercise more than once. Also excluded were cases that have only one or two causes attributed. This provides a more information dense data base. Each case was assessed by 6 markers, and for the purposes of this analysis each of these assessments was treated as a separate case.

A cross correlation of all the causes was performed using SPSS, to identify the cases where the two causes correlated occur together (the crosstab score). The next stage was performed on paper. The first step was to find the largest crosstab score in the whole table. In this instance this was between causes 4.3 and 3.4 which constitute the first members of Cluster 1.

A visual search is then conducted to locate in corresponding rows and columns for these two variables the next highest score on those lines. The next highest value on those rows/columns is then identified, and then the rows and columns on which that cell and its mirror reflection occur are highlighted. Identifying causes which are most like the previously elicited ones continues until no further causes in that cluster are identified.

Excluding the variables included in cluster 1, this method is then repeated until all variables have been accounted for. In practical terms the variables were reordered at each stage and those in Cluster 1 were moved to the top of the list, so that they would not distract in the identification of subsequent clusters. Once the clusters had been identified by Elementary Linkage Analysis, some manual adjustment was made to allow for causes such as 1.2.2 which belonged in more than one cluster. Only 21 of the causes could be placed in a cluster with at least 7 co-occurrences with at least one other cause.

As a result of this analysis 7 clusters were identified, numbered 1 to 7. 2 clusters contained 4 causes, 1 cluster contained 3 causes, and 4 clusters contained just 2 causes. There are 5 clusters with causes that overlap with another cluster by containing a common cause. 17 causes appeared in one or more clusters. All of the significant (3% of total and above, making up 52% of the total) causes listed above in section 7.5.1 appeared in a cluster. The 17 causes appearing in clusters made up 52% of the total listed above in section 7.5.1 above.

We conclude that significant causes clustered.

Table 7.6 set out below shows the clusters identified along with the relative percentages scores from the raw data of the various identified clusters.

	CED Causes reference	CED description	% of total level 3 and 4 scores
Cluster 1	3.1 3.4 4.3 1.2.2	WCW Processor Skills Business Change Management Business Products Reactive / Tactical Objectives	25%
Cluster 2	1.2.2 3.2.5 1.3 3.2.10	Reactive / Tactical Objectives EC Specialist Skills Translation of Policy RLE1 Entitlement Transfers	20%
Cluster 3	3.2.10 2.1.6 2.5.4	RLE1 Entitlement Transfers Maintain Entitlements Data Correct Entitlements	5%
Cluster 4	4.1.10 4.4.3	Claim Processing Base Data	6%
Cluster 5	4.4.3 3.2.1	Base Data Commons Specialist Skills	5%
Cluster 6	2.3.2 4.1.5	Upload SPS (Form Data) Scanning	4%
Cluster 7	4.3.4 4.3.1	Training and Training Materials Desk Instructions	2%

Table 7.6 Clusters of causes and CED data scores

The causes of error conditions were members of clusters as set out below:

- Multiple Payments: All 4 of the 4 major causes appeared in a cluster. Of the less major causes, 3 appeared in a cluster.
- Late Payments: Only 2 of 4 major causes appeared in a cluster
- Change no reason: All 3 of the 3 major causes appeared in a cluster

- Work without change: All 3 of the 3 major causes appeared in a cluster.
- CSP/CCRU: The major cause appeared in 2 clusters
- Appeals: The major cause did appear in a cluster
- Tail cases: Two of the three major causes appeared in a cluster.

7.5.4 Clusters of causes

- Cluster 1 - WCW Processor Skills / Business Change Management / Business Products / Reactive / Tactical Objectives

Cluster 1 links WCW skills to both Business Change Management and Business products (IT systems), and Reactive/tactical management. Rapid procedural change was leading to an inability to process according to changed requirements.

- Cluster 2 - Reactive / Tactical Objectives / EC Specialist Skills / Translation of Policy / RLE1 Entitlement Transfers

Cluster 2 shows a combination of errors caused by customer provided information on the claim form, and entitlement correction, grouped with reactive/tactical management (moving or paying cases outside of normal processing) and translation of policy. This could be because those cases taken out of normal processing showed a higher rate of returning for entitlement adjustment work, due possibly to overlapping time cycles.

- Cluster 3 - RLE1 Entitlement Transfers / Maintain Entitlements Data / Correct Entitlements

Cluster 3 demonstrates that entitlement work, transfers, corrections, and maintaining data, leading to subsequent error conditions, tended to cluster together. There is considerable overlap in the causes themselves, which may have led to difficulties in their being correctly identified in the original CED investigation work. The nature and trading of entitlements, taken together, seems to be a considerable cause of error.

- Cluster 4 - Claim Processing / Base Data

This cluster can be interpreted in two ways. Either, because of an error in the base data, the WCW has made a poor processing decision, or the WCW has incorrectly altered the base data which has led to further downstream errors later in processing.

- Cluster 5 - Base Data / Commons Specialist Skills

As with cluster 4, to which this is similar, this cluster can be interpreted in the same ways. Either an error in the base data has led to a specialist processing error, or the commons task being performed incorrectly has led to an incorrect change to base data.

The existence of clusters 4 and 5 show the important effect that the base data has on correctness of processing.

- Cluster 6 - Upload SPS (Form Data) / Scanning

This cluster clearly suggests that incorrect scanning (which must occur before upload of data) leads to errors in the data upload. This is to be expected.

- Cluster 7 - Training and Training Materials / Desk Instructions

This cluster suggests a grouping of errors around knowledge needed to perform certain tasks being inadequate. The error may have arisen from inaccurate or confusing published procedures or lack of clarity during training.

7.5.5 Relationship of Clusters of cause to error conditions

The relationships of the clusters to the error conditions are set out in the following Table 7.7. This identifies where the causes contained in the cluster had been identified as causing the particular error condition.

Error Condition	Multiple Payments (on time or late)	Late Payments (paid once or multiple)	Change no reason High versions	Work no change High Inter-actions	CSP/CRU cases	Appeals	Tail Cases
Cluster 1	Yes	Yes	Yes		Yes		
Cluster 2	Yes	Yes	Yes	Yes		Yes	Yes
Cluster 3	Yes						Yes
Cluster 4	Yes		Yes	Yes			Yes
Cluster 5	Yes	Yes					
Cluster 6			Yes	Yes			
Cluster 7			Yes				

Table 7.7 Relationship of clusters of cause to error conditions

These relationships between major contributory causes, clusters of causes and error conditions can be represented visually set out in Figure 7.2 below. In the diagram the embossed boxes represent error conditions, numbered rectangles represent causes per the CED, and circles or ellipses represent clusters. Arrows represent relationships between the causes and the particular error condition. Where clusters overlap, the CED cause appears in both clusters.

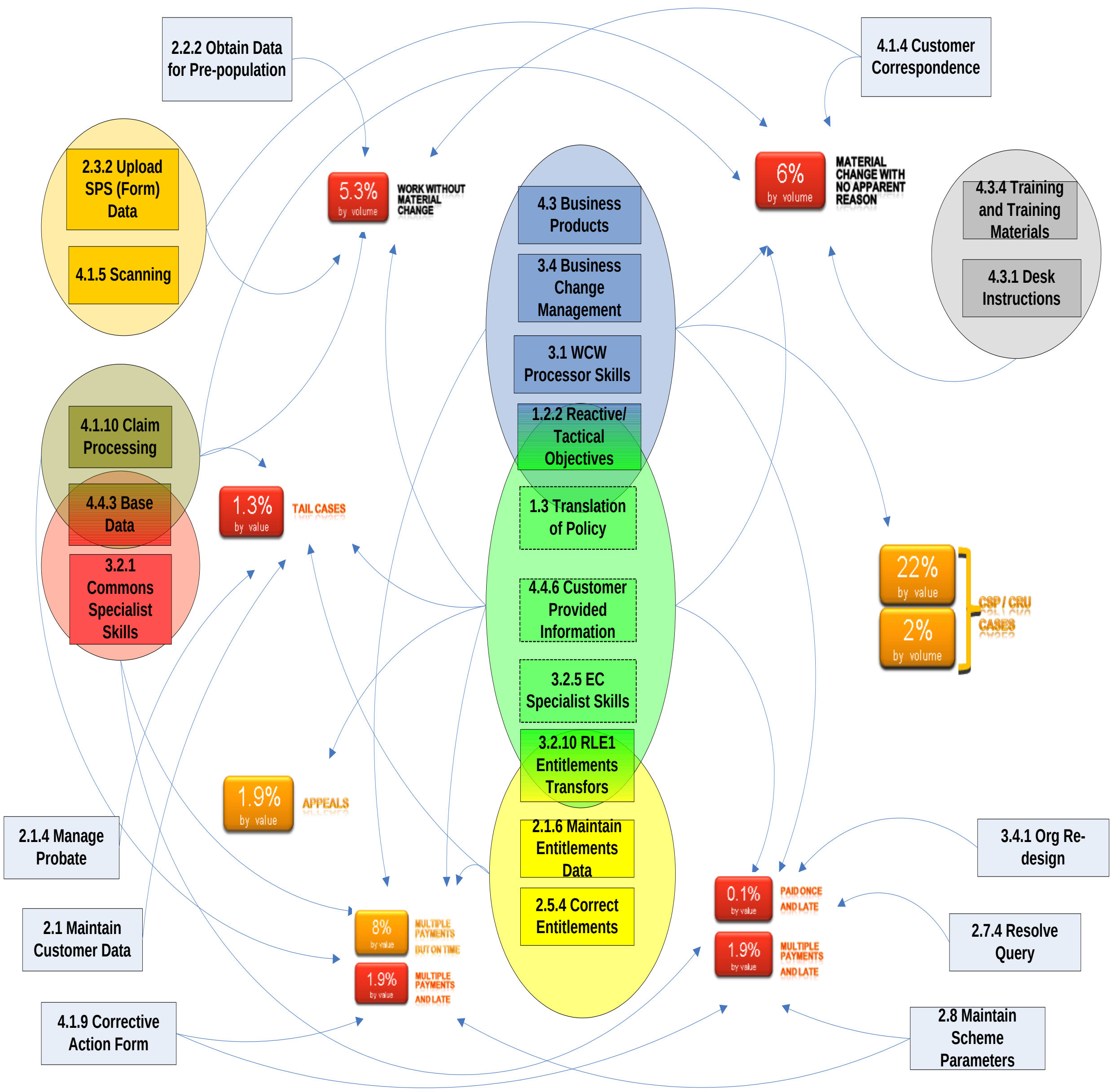


Figure 7.2 Relationships of causes, clusters and error conditions

This diagram summarises the principal findings from the RCA exercise. The diagram clearly shows the absence of a single cause, of clear set of causes, contributing to the poor performance of SPS. It also shows the multiplicity of causes of error conditions of all types.

7.6 Concluding Remarks

This chapter has described the behaviour of SPS in terms of identifying causes of poor performance. This was achieved through an extensive RCA exercise examining a selection of cases over a completed claim year. This represents a cross-sectional analysis. The principal arms of the RCA were Policy (SPS management), Process (derived from the business process architecture in chapter 6), Organisation (processor skills) and Product (IT systems, procedures and data). In broad terms these principal arms contributed to causes of error as follows: Policy - 18%, Process – 23%, Organisation -24% and Product - 35%.

The significant finding from the RCA exercise was that there was no single cause, or easily identifiable set of causes for error and poor performance, but there were a large number of multiple interconnected factors, creating a many to many relationship between causes and effect. Among these were translation of policy, implementation of scheme processing, management of change, customer provided information, entitlement correction and transfers, and base data changes and errors. The interpretation of scheme requirements and the implementation of scheme processing had created an overly complicated SPS system, involving the organisational structure, the operational structure and processes, processing and procedures and IT systems. This confirmed our findings from the structural and process examination in Chapter 6.

The frequent changes to systems and procedures, referred to here as management of change, negatively impacted processing. For example, frequent changes to procedures through reactive management led to confusion at processor level. Customer provided information, represented by the claim form and correspondence caused errors through incorrect treatment of the claim formwork. Entitlement correction and transfers (in which entitlements to claim are traded between landowners) created a web of connected claims through a series of transfers potentially affecting multiple claimants and years. Base data relies heavily on correct land data, which was never correctly established at the beginning of the scheme, leading to multiple year and claimant changes if errors are identified.

Having analysed the cross sectional data obtained during the RCA exercise, we now turn to examining the behaviour of SPS by reviewing longitudinal case data in the next chapter.

CHAPTER 8

DATA ANALYSIS: LONGITUDINAL

8.1 Introduction

Having introduced the case in chapter 5, we have described the structure of SPS in chapter 6 and in chapter 7 examined the behaviour of SPS, and identified causes for that behaviour in a particular claim year across a broad cross section of claims. In this chapter we look in greater depth at the behaviour of a smaller selection of claims on a longitudinal basis, in order to validate, confirm and possibly extend the understanding of the causes of poor performance identified in the earlier chapters.

We review the data gathering method employed which involved making a selection of 20 cases from the 121 that had been reviewed during the expert panel process, as described in chapter 7. Each case is analysed in detail since the beginning of SPS in 2005 in order to provide a more dynamic exploration of the behaviour of the SPS system over time. We then discuss and draw initial conclusions from this data collection using a process of initial pattern coding (Miles and Huberman, 1994a).

This chapter is set out in the following sections:

8.2 Data Collection Method

8.3 Individual Claim Review Results

8.4 Results of 20 case review

8.5 Alignment

8.6 Concluding Remarks

8.2 Data Collection Method

The previous chapter describes the production of an analysis of the causes of error in a sample of 121 cases which were in error in 2008. As such it may be described as a cross sectional analysis. In order to validate this analysis and explore causes of error further it was necessary to conduct an in depth longitudinal examination of a number of cases.

Longitudinal analyses have a number of strengths and advantages over a cross sectional approach. Cross sectional studies take data from a population at a single point in time. Although they are useful in assessing causality and correlation, findings do not necessarily indicate direction of causation, or explain why events occurred (Easterby-Smith et al., 2002). Longitudinal studies, involving data collection over time, are more useful when the focus is on studying change or causality (Van de Ven and Huber, 1990).

The SPS "system" is considered to be socio-technical system (Emery and Trist, 1969) and comprises a number of IT systems, specialist and generalist workers, and outsourced partners, operating within a technically complicated "dynamic hybrid scheme", which required considerable knowledge acquired through training and operational experience to access data. We formed the opinion that data gathering would have to be mediated through RPA staff.

20 cases were chosen for examination. The case notes held on the various IT systems were then reviewed from the start of the scheme to provide a form of life history narrative of significant events and errors occurring on the case. This was done by an experienced whole case worker reviewing case notes held on RITA and associated systems, while one or two researchers observed, discussed, challenged, asked for clarification, suggested further enquiries and made notes. Due to the size of the case histories, only significant events were captured, since not all the data and events on each case could be reviewed in this way.

The interviews took place continuously over a period of 4 days. Verbatim manuscript notes were typed up off site; meanings were clarified with the case worker as necessary. Where there were two sets of researcher notes, these were compared subsequently and a final set agreed upon. Further clarification and insight was gained by discussing the interview results with a member of RPA Policy Directorate, over a series of on and off site meetings.

20 cases was a reasonable subsection of the 121 previously examined, in the light of the necessary depth of examination and the time available. The first case reviewed took approximately 3 hours. On average each case took 1.5 hours to examine. The 20 cases were chosen for examination on the basis of theoretical sampling (Glaser and Strauss, 1967), from the 121 cases examined during the CED analysis based on their initial error condition. In analysing the behaviour of SPS we were most interested in performance rather than resource consumption or any customer segmentation. Accordingly the selection of cases was biased towards late and multiple payments. Based on their 2008 error condition, the totals examined were as follows:

2008 error condition	Number of cases examined
Late and multiple payments	12
Potentially unnecessary work	3
CSP/CRU	1
Appeals	2
Tail Cases	2

Table 8.1 Selection of cases for further investigation

Further details by case are set out in appendix 8A.

The purpose of the detailed review was to identify a longitudinal time sequence for the case, to verify the causes identified by the panel review, to identify any causes that had not previously been identified through the cross sectional Root Cause Analysis (RCA) carried out in Chapter 7, and also to identify key longitudinal cause effect relationships that would not have been apparent from the RCA exercise.

We collected qualitative data in the form of key “events” in the life history of the case which now need to be analysed. Miles, et al. (1994) suggest that qualitative data analysis through coding is best informed and controlled through use of the research question and conceptual frameworks. We have achieved this by repeatedly bringing the research process back to the research issue, the analysis of problems, and continuing to use a systemic approach.

There are 3 stages in the analysis of data which tend to run concurrently through the coding process: data reduction, data display, and conclusion drawing. The method used employed for data reduction and display was a simplified form of initial coding, pattern coding and mapping. Miles et al identify 3 ways of coding: a priori using a preset list of codes, inductively letting the codes emerge from contact with the site and data (mainly used in grounded theory (Strauss and Corbin, 1998)), and a hybrid form using a "general accounting scheme" range of themes highlighting domains of interest such as processes, activities and events (Miles and Huberman, 1994a). The coding process is generally used to code text, when the data is obtained in that form, and e.g. numerical manipulation cannot be performed on it (Miles and Huberman, 1994a). In this research we are not seeking to build grounded theory from the analysis of text, and have a sequence of recorded events and incidents in each case, (albeit recorded in text in both the SPS case notes, and our interview notes) but still need a method to reduce and display the data in order to form meaningful conclusions. In this exercise rigour was achieved through the use of multiple interviewers, the depth of the previous analysis, a range of data sources, and the use of experienced staff for clarifications. Results were discussed with and presented to senior management.

8.3 Individual claim review results

8.3.1 Significant events narrative

The interview notes prepared by the researchers were reviewed for "significant events", which were then drawn up into narrative form. An example for case 1 is set out below:

Case 1 – Late payment.

In 2005, maps were sent to the claimant for confirmation of the size and use of land parcels. The claimant returned the maps, in which some eligible, claimable arable land was not activated. By not activating this land, the claimant lost the ability to claim any of it in the future. No advice was given to the claimant that he was omitting the potentially eligible arable land.

An illegal parcel (under the 0.1 size minimum) was created by the RPA from the detail returned by the farmer. This parcel was a segment of a larger field which should have been joined together by the WCW, but was not. In 2006, the pre-populated form was sent to the claimant containing the illegal parcel. The claimant activates his entitlements on the Arable land on his claim form. The claimant signs and returns the SP5 annual claim form.

The pre-population of the 2007 SP5 form drops/omits the pasture land that the claimant did not activate the year before. The claimant did not act to change/adjust this error. The same year, the illegal, below-minimum parcel sent out in the 2006 pre-populated form was 'zeroed-out' by RITA, effectively dropping it from the claim. Dropping this illegal parcel also drops the overall size of the claim below the minimum claim threshold of 0.3ha. This triggers a penalty and disallowance in 2009 against this claimant, when the discrepancy is finally discovered. Errors in RITA programming allowed a claim falling below the minimum total hectarage threshold (0.3), and the minimum field size (0.1) to be processed from 2007-2009.

In summary, this claim had a legitimate potential land size of 0.7 hectares, but through a series of technical errors, claimant errors, processor errors, and misunderstandings, the claimant was penalised and the claims disallowed.

Similar narratives for each case are set out in Appendix 8B Cases Analysis.

8.3.2 Case maps

Following the preparation of the detailed case narratives, a pictogram / event history diagram was drawn up for each case in the form of a simple flowchart or map. This showed in summary, by grouping and summarising the recorded events, the pattern of events that had affected that case. Notes and observations were made on the diagram in the form of "dialogue boxes" using a different unconnected shape and coloured background. These marginal notes reflected our evolving thinking and can be compared with "memos" used in traditional coding techniques. An example for case 1 is set out in Figure 8.1.

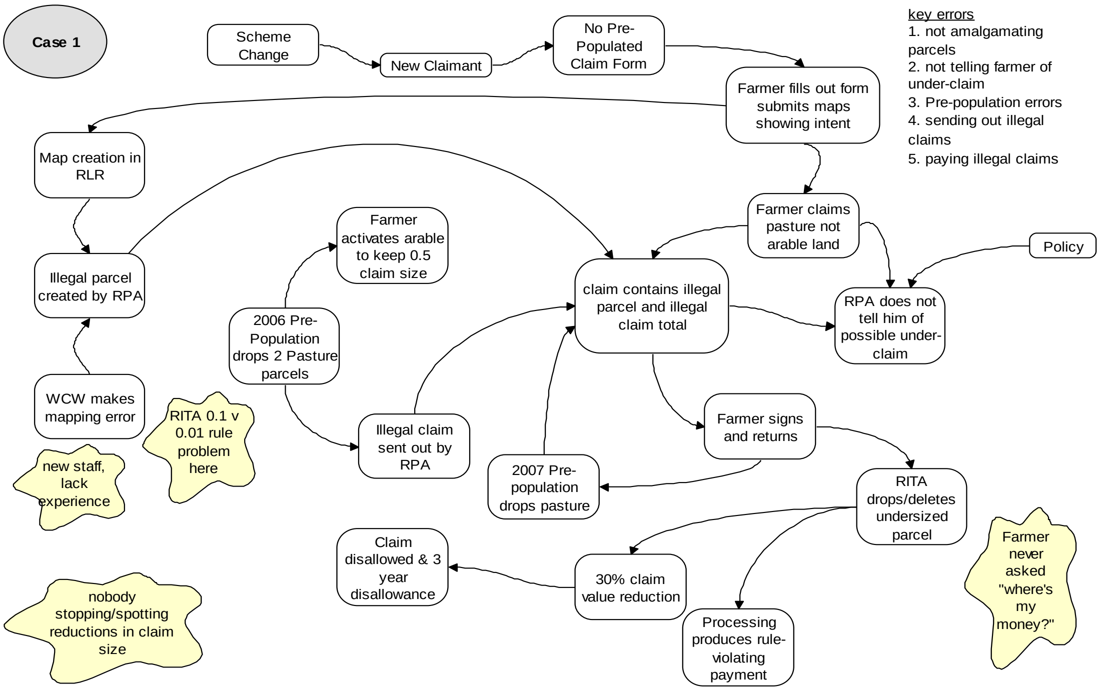


Figure 8.1 Pictorial representation of Case 1

Charts for all 20 cases are set out in Appendix 8C Case Maps

8.3.3 Key events list

At the conclusion of this exercise a detailed understanding had been built up of the events in each of the 20 cases along with some of the causal factors and ongoing effects. In order to commence the coding we then listed the key events in each case in a table. An example for case 1 is set out below in Table 8.2.

Case number	Event
1	scheme change
1	new pony paddock in 2005
1	no prep pop claim form
1	manual entry of data
1	map creation required in RLR
1	creating base data
1	farmer fills out forms and maps
1	farmer claims pasture and not arable
1	RPA does not tell him of under claim
1	ineligible parcel created by RPA in RLR
1	Processor error in mapping an ineligible parcel (2X parcels under min value)
1	2006 prepop drops 2 parcels of pasture
1	farmer activates arable to keep 0.5 claim size
1	2007 prepop drops pasture
1	creates two parcels; one illegal/total illegal
1	illegal claim sent out by RPA
1	illegal claim sent out by RPA
1	RITA deletes illegal parcel
1	30% claim reduction penalty
1	claim disallowed and 3 year penalty
1	processing produces rule violating payment

Table 8.2 Events list for case 1 detailed examination

A full list of the events table for all cases is set out in Appendix 8D.

8.3.4 Case event codes

The events in each case were now coded by using an emerging code method; i.e. events in each case were coded sequentially and where a similar event had occurred in a subsequent case, e.g. “IT system error”, this was allocated the same code. The codes allocated to each event by case are set out in Appendix 8D, and a full list of the resulting codes is set out in appendix 8E. Using this method a total of 65 codes were derived with a total of 345 occurrences.

The most frequently occurring codes were “standard claim processing”, “IT system error”, “farmer intent”, “commons standard processing”, “non standard processing” and “RPA tactics”. These 6 codes represented 38% of the separated events identified. The next step was to review the codes and collate those relating to errors and causes of errors into identifiable themes. Set out below in Table 8.3 below for comparison are the significant causes and codes from the root cause analysis and from the case reviews.

RCA Principal Errors	20 case review principal errors
Reactive tactical management	Standard claim processing
Customer provided information	IT system error
Translation of policy	Farmer intent
WCW processor skills	Commons standard processing
Business products /IT systems	RPA tactics
Business change management	Non standard processing
Upload SPS form data	Payment top up
Customer correspondence	Payment under
Correct entitlements	Processor error
Claim processing	Entitlement correction
Entitlement correction	Over payment
Commons processing	Farmer error
Overpayments	Customer data processing
Base data	Commons entitlement change
Corrective action form	Cycle deadlines
Claim data	Claim data
Maintain land data	SPS form data error
Maintain entitlement data	Form prepopulation error

Table 8.3 Principal RCA errors and 20 case review codes compared

As can be seen the original RCA causes were broadly confirmed at this stage of the review, although obviously some of the codes arising from the 20 case review represented normal processing of a case identified during the research.

8.4 Results of 20 case review

8.4.1 Summary of errors

With each successive stage of analysis, and the exercise of coding, we were gaining greater knowledge and insight into the routine and non routine behaviour and error creation and correction of SPS. We used this to summarise our findings for causes of error into the following broad themes for categories of error cause identified during the 20 case review.

- Base data errors
- Form pre population errors
- Farmer errors in form completion
- Scanning errors
- System errors
- WCW errors
- Land and entitlements trading
- Processing cycle alignment
- Commons land

These are discussed in more detail below.

8.4.2 Discussion of errors

- Base Data Errors

The base data errors were made at the set up of the scheme in 2005, and can be further subdivided into land errors and entitlement errors. These affected the accuracy of the data held on the various IT systems and associated databases. There were 4 significant causes for these errors. The first was the use of HVDC (High volume data collection). This was the internal term for the process that was employed at scheme set up to input the base data into the various systems. The original intention was that the bulk of this was to be automatic but it was found that neither the data quality nor systems were sufficiently good or well developed, which led to the recruitment of agency staff to input data manually in order to meet scheme start deadlines. This led to errors being made in base data across SPS. Given the nature of the scheme, when these errors are identified, often in subsequent years they lead to the need to recalculate payment values, and may affect more than one farmer if land or entitlements have been traded.

The second significant theme was mapping errors. Owing to the high number of new entrants to the scheme, (approximately 30,000), new base data had to be created using hard copy maps submitted by the farmer based on Ordnance Survey maps. These were then transcribed using specialist software, but with a degree of manual input correction and control. Errors were made at this stage, sometimes due to the inexperience of the staff member, sometimes due to the nature of the software. When identified, by a physical inspection or WCW review, corrections are needed. Mapping errors have a similar effect to land and entitlement errors in that once identified they affect value calculations back to 2005, and may impact other farmers.

The mapping errors were exacerbated by the failure to complete a 100% inspection (the third theme) at the start of the scheme to ensure land base data accuracy. The fourth connected element was the errors made by farmers, especially new applicants, when completing the intial document set. Again these led to base data inaccuracies which when identified led to the need for multiple corrections and recalculations.

Some the existence of these 2005 errors can be attributed to the choice of a complicated dynamic hybrid system in which land and entitlements were both used to process claims and calculate value, and to the decisions noted in chapter 5 to introduce the scheme into an agency which was undergoing radical change, which led to the need to recruit temporary unknowledgeable staff to set up the scheme. These errors were compounded by not performing a 100% land inspection to ensure that all land area data was valid and claimable under the scheme.

The effect of these errors continue through each claim year until identified, thus increasing subsequent effort, and once identified (e.g. by a land inspection or a WCW review) can lead to revision of incorrect payments in previous years, and potentially affect other claims, also in previous years if affected land and entitlements have been traded. Revision of payments will lead to over and underpayments leading to action for recovery and can lead to fines and penalties on the farmer and RPA and consume resource and time. The larger the number of original errors and the longer they remain unidentified the more will be the number of incorrect payments.

- Form prepopulation errors.

Annual claim forms with data prepopulated based on the previous year's claim and known corrections, (e.g. as a result of a sale or land inspection) are sent to the farmer, for review and signature, or correction (e.g. as a result of field change or entitlement activation). Due to system errors, this prepopulation was often found to be inaccurate. In addition we identified that the various processing cycles operating within SPS were not aligned. The alignment of processing cycles is dealt with in more detail below. The effect of this is that future year claim forms are distributed to farmers before final processing and error correction of this year's claim has been completed. This will lead to non-alignment of the (new accurate) data and the (old incorrect) form. The farmer may then manually correct the prepopulated form, if he notices the error, which will lead to potential for scanning error and manual WCW corrections and intervention.

- Farmer errors in form completion

Farmers often made errors in completing or reviewing the prepopulated form. This was in part due to the capability of the farmer, the frequency of changes to the formwork leading to the inability to use past experience, and the farmer's natural expectation that the formwork would be correct. Manual corrections to the form would lead to intervention to process the form, and incorrect payments as a result of inadequate farmer review would lead to work to recover or top up payments either in the current or previous years.

- Scanning errors

Prepopulated forms are scanned into the IT system on return from the farmer. Two types of error were identified. The first occurs when the scan is unable to read any corrections or changes made by the farmer. The second is when the scan fails. Both lead to extra correction work before the claim can be processed further. Incorrect claims can lead to over or underpayments and subsequent recovery work.

- System errors

System errors occurring in the main RITA system led to incorrect value calculations, resulting in incorrect payments, resulting in further recovery or top up payment action being required.

- WCW errors

We noted that at times there was insufficient audit trail or ownership of an assigned case, and errors were often corrected sufficiently to pass the case on, but not sufficiently to make an accurate calculation. Different case workers applied different methods to similar problems, attributable in part to constantly changing procedures.

- Land and entitlement trading

This theme splits into two relating to entitlements and their transfer between farmers, and processing deadlines overlapping. Entitlement transfer has led to a number of related problems. The original IT system was not designed to accommodate entitlement transfers and a subsequent upgrade was delayed and not implemented until 3 years after scheme commencement. This created a backlog of necessary changes and resulting payment adjustments.

- Processing cycle alignment

We identified that claim years overlapped. That is, the claim year for year 1 (Y1) started in Quarter 2 (Q2) year 1, the target payment date was towards the end of Q4/Y1, and processing (at this point mainly error correction) was not completed until Q3/Y2. This meant that processing work for year 1 would not be completed before the data cut for prepopulating forms for Y2 had been taken in Q1/Y2 resulting in claim forms for Y2 containing known errors being sent to farmers. In addition to claims processing, non claim processing ie changes to land and entitlements continued throughout the year. The cut-off date for an effective entitlement change to be included in the current year's claim was approximately 3 months after form prepopulation, thus allowing for more errors to be introduced.

- Commons land

Regular reviews and reinterpretation of the common land register, administered by bodies outside the RPA, and changes in claimants, led to on-going adjustments to sets of claims after payment had been made. A change made to any claim on a common affects all other claims due to the nature of the calculation.

8.4.3 Causes and effects of errors

A summary of these errors, causes and potential effects is set out below in Table 8.4

Category of Error	Types	Caused by	Potential Effect
Base Data	Land	HVDC	Incorrect land parcel values accepted into crucial introductory data; affects all years forward until corrected.
		Mapping	Incorrect land parcel values accepted into crucial introductory data; affects all years forward until corrected.
		Inspection Absence	Incorrect land parcel values accepted into crucial introductory data; affects all years forward until corrected.
	Entitlements	HVDC	Inaccurate entitlement values accepted into crucial introductory data; affects all years forward until corrected.
		Farmer error	Inaccurate entitlement value accepted into crucial introductory data; affects all years forward until corrected. Leads to penalty/disallowance if error is greater than actual entitlements.
Form Pre-Population Errors	Omission	System dropping data	Incomplete claim forms sent out; signing leads to farmer losing land/entitlements.
	Commission	Taking cut before all tasks completed on all claims	Unaligned data. Necessary work to align the data. Confused farmer who needs to change data sent to him after it was corrected with him last year.

Category of Error	Types	Caused by	Potential Effect
Farmer Errors in Form Completion	Incorrect entries	Farmer Capability	Tasks in RITA; work to investigate the task; work to correct error.
	Correct entries in wrong place	Farmer Capability & Frequent Changes to Formwork	Tasks in RITA; work to investigate the task; work to correct error.
	Assuming form correct	Farmer Trusts RPA & RPA Assumes Farmer Reviewed the Form	Form processes successfully but the payment is wrong. Farmer either paid too much and we penalise him; or paid not enough and we say 'too bad'.
Scanning errors	OCR	Poor filling out of the form	Misalignment of data; Task raised to correct if Over-Claim, but nothing done if under-claim. Under-claim leads to inaccurate payment.
	Scan Failure	IT system fails, scan cannot be used	Spate of OLV errors to correct; work to correct errors.
System Errors	Value dropped	IT System Performance Error	Wrong value payment; top-up work if farmer notices.
	Working day	Lack of Updated Rules in IT System	Incorrect penalties, top-up work.
WCW Errors	All	Lack of Case Notes	No audit trail; longer familiarisation period when someone picks up the case.
		Ownership of processing	WCW makes a fix, not a correct solution; creates work down the line to find the correct action.
		Different methods	Constantly changing procedures.

Category of Error	Types	Caused by	Potential Effect
Non-Claim Cycle Errors	Entitlement transfers	Farmer error	An appeal is filed and must be processed.
	Land & Entitlement transfers	Probate delays	Some work (legitimate); late payments which need to be dropped from reporting as they are legitimate delays.
Processing Cycle Alignment	Deadline Overlap	Differently aligned deadlines	More RPA-created work. Changes made after the pre-population data cut create misalignment in data for the current claim year, thus creating extra work and possible payment adjustments.
Commons Land	Entitlement adjustments	Regular review and re-interpretation of the Commons Land Register	Changes to CLR cascade into payment adjustments if processing continues after some payments are made.

Table 8.4 Summary of causes of error identified during 20 case review

8.5 Alignment

The SPS "system" is required to be able to pay the "right amount" to the "right farmer" at the "right time". The "right amount" is predicated on eligible land, activated entitlements, and the annual valuation where the English share of EU subsidy is allocated amongst eligible claims; the "right farmer" on legal rights to land and entitlements, and the "right time" defined as once during the payment window according to EU rules. Data on these components is held across SPS on a number of different and unconnected databases, and is also affected by external registers such as common land.

We noted in several cases a lack of alignment between the actual eligible land, and the data held about the land and used in calculations. This has arisen due to the effort involved in performing a 100% inspection of land in order to agree eligible land between the farmer and the RPA at the introduction of the scheme. The effect of this is that if a subsequent physical or remote inspection identifies and disqualifies ineligible features, (e.g. a pond or wider than acceptable ditches) all previous claims have to be recalculated, and potential penalties raised. This may impact on other claimants if such land has been transferred.

These 3 types of misalignment, firstly between databases, and secondly between some databases and the actual eligible land, and thirdly between the claim form and the databases against which it will be checked and may have originated, leads to a certain processing paradox. The processing ideal is for the claim to process straight through without requiring excessive manual assistance or rework. This may happen if the form is unchanged and agrees with the databases. However, a database in particular may be incorrect in not reflecting eligible reality, and thus thought the claim has successfully processed, it is in effect wrong, and will when the ineligibility is identified lead to changes being required in previous payments.

A lack of alignment between the claim form, the processing database, the land database and the actual land causes formwork not to process, requiring manual intervention and correction. Overlapping time cycles and deadlines for processing lead to inappropriate claim forms being sent to farmers who become responsible for their correction. Corrected forms become non aligned and fail to process. The farmer may make errors in amending the incorrect forms.

In addition because a farmer can under claim, (e.g. not activate all his entitlements in a particular year) the supposition within RPA is that a potential under claim should not be reported to the farmer. This again could lead to a claim form processing straight through, but the system failing to pay the "right amount", thus disadvantaging the farmer. This is significant since the purpose of SPS is to pay the right amount to the right farmer.

Under the current scheme design, 100% checking is needed to achieve the required 100% accuracy, (and the checking is on-going as ineligible features may be created after the check has been performed). This requirement within SPS of seeking accuracy is potentially to the detriment of other strategic targets, such as timeliness. Since the identification of an error can lead to the need to check within the claim and in other claims, the search for extremely high levels of accuracy, with minimal tolerances, leads to a knock on effect which generates tasks and hence work, which can divert resource from other activities.

8.6 Concluding Remarks

In this chapter we have deepened our exploration of the SPS system, by conducting a detailed longitudinal review of 20 cases. This has broadly confirmed the conclusions from the structural analysis in chapter 6, and the cross sectional analysis. This chapter has established a concrete foundation of fact concerning the causes and effects of error and the behaviour of SPS. The main conclusions concerning factors causing poor performance from this review are as follows.

Base data accuracy

The process by which the original base data was set up led to errors being created which are only identified during subsequent investigations. Once identified these changes lead to impacts on multiple claimants and over multiple years, although the claim may have earlier processed successfully.

Data discrepancy and alignment

Data is represented by actual land, entitlements and land data held on the variety of IT systems, and the claim form. For a correct payment to be made, all this data needs to be correct and in alignment. However a case may process successfully in a particular year, even if elements of the base data are incorrect. Subsequent identification of the error leads to the need for multiple corrections.

Overlapping processing cycles

Processing cycles for claim processing, land and entitlement adjustments and corrections are not co-ordinated, leading to different data being held across different databases and claim form inputs. This may prevent a claim form from processing successfully. This can also lead to errors in following year claim forms distributed to farmers, potentially leading to more corrections being necessary.

Multiple past year effect of corrections

Identified errors e.g. in base data, can lead to multi-year changes. Such changes can result in top up payments or recovery work. This leads to uncertainty on what an accurate payment represents, and to difficulty in separating out the multiple manifestations of a case problem involving overpayment, underpayment, entitlement correction, which leads to excessive resource and time consumption.

Claim interconnectedness.

Many claims are interconnected, either through sale of land and entitlements, or through common land, as well as the payment calculation requiring all claims to be processed together. This means that changes to one claim will affect other claims.

Having concluded our data collection, we now turn to analysing the data for evidence of wicked themes in chapter 9.

CHAPTER 9

DISCUSSION

9.1 Introduction

In this chapter we will analyse our data and address our research objective, identifying the characteristics of wicked operational problems. The research covered the structure and behaviour of SPS, both in its overall processes and individual cases. Chapter 5 introduced the case. Physical, operational and process structures were examined in chapter 6. In chapter 7 SPS behaviour was examined from a cross sectional viewpoint, and longitudinally in chapter 8. It is now possible to use this data to determine empirically whether SPS can be considered to evidence any characteristics of a wicked problem.

The chapter is set out in the following sections:

9.2 Wicked themes

9.3 Structure of SPS

9.4 Behaviour of SPS, cross sectional and longitudinal

9.5 Characteristics of wicked operational problems

9.6 Contribution

9.7 Concluding Remarks

9.2 Wicked themes

The conceptual themes of a wicked problem were derived in Chapter 3 from the analysis of the 10 characteristics underlying wicked problems as set out by Rittel and Webber (1973). These themes were:

1. Multiple explanations
2. No stopping rule
3. Interconnectedness
4. Intervention has consequences
5. Uniqueness
6. Planner's responsibility

Operational definitions for the themes were suggested as follows:

1. Multiple explanations: The information needed to understand the issue is inconsistent and allows multiple explanations,
2. No stopping rule: there are no criteria for knowing an optimum
3. Interconnectedness: Circular causal chains with strong linkages
4. Interventions: Interventions have unintended, significant consequences
5. Uniqueness: Cannot develop or apply a generalisable solution
6. Planner's responsibility: "planner" taking ownership of situation.

This chapter analyses our empirical research findings against these themes. Each of our principal findings for structure and behaviour and accompanying detailed data will be reviewed sequentially against the first 4 of these themes. Evidence of the theme will be noted in the respective tables for structure and behaviour. These findings will then be discussed in section 9.5. Within the context of a processing operation and this exploratory study, it is not possible to extend the empirical tests to the latter two themes. The theme of uniqueness will be discussed in section 9.5.5, and the theme of planner's responsibility will be discussed briefly in section 9.5.6.

9.3 Structure of SPS

9.3.1 Physical and operational structure

Chapter 6 reviewed the structure of SPS by using geographic analysis and process mapping to record the processes. The geographic layout and IDEF0 maps show the complicated physical, geographic and processing structure of SPS within RPA. The following structural features were identified:

- Physical structure: The large number of sites and their geographic dispersal led to operational hand offs of work, potential duplication and disconnects. Specialisms, such as commons and entitlements were also split. The operational processing of claims is potentially split over multiple sites involving various hand offs and incomplete information transfer, leading to potential duplication of effort, and the opportunity for errors to be passed on.
- Operational Structure: The operational procedures were rigid, with low discretion, but workarounds had been developed locally. SPS was not particularly customer focussed. There was a multiplicity of IT systems, with some user developed unofficial systems. A task based scheme had been changed to case working.

Table 9.1 below sets out these findings analysed against the themes.

	Theme			
Data finding	Multiple explanations	No stopping rule	Interconnections	Intervention Has consequences
Large number of interconnected sites	Yes The number of hand offs led to duplication and inadequate information flows		Yes The geographic map shows the number of connections necessary	
Split specialisms	Yes This led to the potential for different practices on different sites		Yes Data needed to be transferred across sites	
Multiplicity of systems	Yes The large number of systems led to discrepancies between them		Yes The IT systems needed to be reconciled	
Procedural and organisational changes				Yes The ongoing changes impacted performance levels negatively

Table 9.1 SPS physical and operational structure analysed against wicked themes

9.3.2 Process Structure

The research demonstrated that SPS processing is complicated and interconnected. A large number of loop backs exist within and between processes, meaning that work does not flow sequentially The process maps highlighted the large number of IT systems, and hand-offs between individuals and departments. The existence of a significant number of feedback loops indicate strong connections between the process steps within SPS, and that errors are returned to earlier stages in the process for correction and rework. The multiplicity of IT systems also means that a number of separate databases needed to be maintained.

Table 9.2 below sets out below the principal findings for process structure against the wicked themes.

	Theme			
Data finding	Multiple Explanations	No stopping rule	Interconnectedness	Intervention has consequences
Large number of feedback loop backs			Yes The process steps are highly interconnected and work does not flow sequentially	
Large number of official and unofficial IT systems	Yes The existence of many systems leads to different data being held on each			
Errors returned for reprocessing				Yes Cases were returned to the beginning of the process for correction
Large number of hand offs			Yes The hand offs mean that processing has many connections between functions	

Table 9.2 SPS process structure analysed against wicked themes

9.4 Behaviour of SPS

9.4.1 Behaviour of SPS– cross sectional (single year)

Chapter 7 investigated the causes of the operational performance of SPS using Root Cause Analysis in the form of a cause and event diagram. For this level of analysis, the population was cases with specific error conditions, from which a sample was selected for review; this cross sectional analysis covered claims being processed in a single year with an error condition.

The exercise was carried out by performing a root cause analysis review based on a cause and effect diagram, with the main branches of the diagram being Policy, Process, Organisation, and Product (IT systems).

The significant findings from this analysis were:

- No single identifiable cause or set of causes to explain poor SPS performance
- Cause to effect had a “many to many” relationship
- Causes formed into clusters, involving more than one main branch of the CED
- Frequent changes to procedures and systems were being made

Table 9.3 below sets out these findings analysed against the wicked themes.

	Theme			
Data finding	Multiple Explanations	No stopping rule	Interconnectedness	Intervention has consequences
No single root cause for poor performance	Yes The absence of a single root cause implies that there are many explanation for poor performance			
Cause to effect had many to many relationships	Yes It was not possible to relate a single effect to a single cause			Yes Any changes would have unintended consequences
Causes formed into clusters, involving more than one branch of CED	Yes It was not possible to identify a principal set of causes (e.g. IT systems)		Yes causes were highly connected	
Frequent changes to procedures were being made affecting performance		Yes Procedural changes were ongoing		Yes The changes were significantly affecting performance

Table 9.3 Cross sectional results analysed against wicked themes

9.4.2 Behaviour of SPS longitudinal (since beginning of scheme)

Chapter 8 reviewed the processing history of 20 cases in detail. The findings were analysed by identifying common themes occurring across multiple cases (Table 8.4).

The overall findings from this analysis were:

- Base data: errors made during the setting up of base data exercise carried forward to subsequent years and adjustments made to correct errors may affect more than one claim
- Input form errors: data on claim forms was incorrect
- IT system errors: values incorrectly calculated

- WCW errors: different methods for claim processing
- Land and entitlements trading: claims and any adjustments to base data were connected
- Processing cycle alignment: overlapping processing cycles led to ongoing correction work
- Commons land: all commons land interconnected, with ongoing revaluation exercises
- Database alignment: the lack of alignment between the principal inputs and calculation databases of SPS was a significant feature in causing processing failure. These were the IT processing system, the claim formwork, the land database, and the actual land. Different databases held versions of data which did not match each other or the underlying land.

These findings from this exercise are analysed against the themes in Table 9.4 below:

	Theme			
Data finding	Multiple Explanations	No stopping rule	Interconnectedness	Intervention has consequences
Base data errors		Yes Errors made during this exercise carried forward to subsequent years, and when corrected carried back to previous payments	Yes Adjustments made to correct errors affect more than one claim/SBI	Yes these initial errors in setting up database had significant impacts
Input form errors	Yes IT system errors and taking data cut before processing corrections finished			Yes Errors and corrections to formwork led to significant processing issues
IT System errors				Yes Errors affected other years leading to subsequent revisions of payment
WCW errors	Yes Different methods for claim processing	Yes No external check of calculations possible		
Land and entitlement trading		Yes Because trading corrections to one claimant had significant impact across claimants and previous and future years	Yes Land and entitlement trading led to networks of interconnected claims	
Processing cycle alignment		Yes Processing not subject to a single annual cycle	Yes Processing errors led to claims corrections	
Common Land		Yes commons changes could affect previous years for all commoners	Yes All commons holdings interconnected	Yes Annual Changes in register impacted all claimants
Database alignment	Yes Different databases held different information which did not agree with actual land			

Table 9.4 20 case review findings analysed against wicked themes

9.4.3 Individual case review

We are also able to review each case in detail for evidence of the wicked themes; this analysis is set out in Table 9.5 below.

	Wicked theme – evidence for wickedness from each case			
Case number	Multiple explanations	No stopping rule	Interconnectedness	Intervention has consequences
1	Base data errors / data alignment	Valid claim turned into penalty		Base data and processing errors led to reduced claim and eventual penalty
2	Data alignment	Under and overpayment at same time	Sale of entitlements creates network	Inspection and ineligible feature creates adjustment to payment amounts
3		Prepopulation data taken while processing	Commons adjustment	Correction led to payment changes back to 2005
4			Commons and other SBI change	Error correction led to late and multiple payments
5				Processing errors led to no payment
6		Payment not able to be calculated	Entitlements traded in multiple transfers	
8	Data alignment	Payment adjustments		Entitlement correction led to payment changes back to 2005
9	Data alignment			Mapping errors lead to Entitlement Correction work and corrections back to 2005
10		No rule for assessing correctness of calculated payment		System errors leads to payment correction work
11	Data alignment	Unable to calculate payment value		Failure to correct alignment leads to penalties being levied
12	Data alignment	Claim accurate and inaccurate at same time	Commons adjustments	IT system error leads to payment corrections
14			Entitlement trading affects multiple claims	Processing errors led to incorrect entitlement transfer
15				Processing error led to payment penalties
16		Unable to calculate correct payment value	Commons review and adjustments	Changes led to payment corrections back to 2005 and identification of further errors
17	Data alignment			Systems error leads to processing failures
18		Unable to calculate payment value		
19		Underpayment and overpayment	Part of entitlement trading network	Changes led to adjustments back to 2005
20	Data alignment			Error correction work delayed payment

Table 9.5 Individual cases analysed against wicked themes.

9.5 Characteristics of wicked operational problems

Summarised above are the ways in which the key features of our empirical data fit the wicked themes derived from the 10 properties of wicked problems. The next section summarises the evidence for each of the themes in turn.

9.5.1 Multiple explanations

This theme suggests that the existence of a discrepancy or a problem can be explained or dealt with in more than one way, and that the problem, in this case poor operational performance, has many causes for which there are many potential solutions.

There is evidence for this theme within SPS structure and operations. These are as follows: the multiplicity of sites leading to different work practices, the absence of a single root cause for poor performance, and misalignment between databases.

The multiplicity of sites leads to different work practices emerging between WCW in different sites which means that the same processing problem will be dealt with differently.

The RCA indicates that there are multiple and linked explanations and causes for processing errors. This multiplicity of explanations means that it is unlikely that a single improvement tool directed at a single cause (e.g. IT systems, or WCW skills) will improve performance. There is no obvious starting point for any improvement activity.

There is a lack of alignment between databases holding different values for the same information (e.g. eligible land and entitlements) used in processing and calculation, and potentially differences with actual eligible land. The alignment, or lack of it, between the principal inputs and calculation bases of SPS, was a significant feature in causing processing failure. These were the IT processing system, the claim formwork, the land database, and the actual land. Different databases holding different information calculated values differently or required manual intervention for correction.

The calculation of claim value, and hence the "solution" changed dependent on "known" data but this was reliant for its accuracy on potentially "unknown" data e.g. ineligible features / entitlement transfers. The existence of databases misaligned with each other, and possibly not reflecting the reality on the ground (due to mapping errors or lack of inspection) meant that at any one time, and through time, there was potentially more than one calculation of claim value that could be deemed to be correct according to internal or external data. Action to correct part of the situation (e.g. 100% land inspection) would have unforeseen consequences in revising historic calculations based on the revised data (e.g. leading to recovery of previous overpayments) which would not necessarily improve processing in a particular claim year and might still mean that performance did not meet requirements.

As demonstrated in chapter 8.5 database alignment was more important to timely processing than either data accuracy or accuracy of payment, and that it is possible for a case to process completely and on time, but not be accurate or correct.

9.5.2 No stopping rule

This theme suggests that in a problem situation there is no rule based end point for information gathering, solution generation, and no ultimate test for rightness; hence a solution is decided upon for reasons such as resource or time running out.

In an operational sense the no stopping rule for the process and the claim being processed would mean that there is no clear rule for to establish definitively the correct payment with 100% accuracy. Processing could continue indefinitely, and only stop on a time basis. This processing would include the gathering of necessary information to make assessments and calculations, and the creation of potential solutions, and the finalisation and completion of the final activity (in case of SPS an accurate and timely payment). There is no immediate and ultimate test of a solution for rightness.

There is evidence for this theme within the behaviour of SPS. This is contained within 3 broad areas of information and process: the trading of land and entitlements; potential for recalculation of previous payments; overlapping process cycles.

The requirement for recalculation of previous payments on the identification of a processing or data error, the annual nature of the scheme and the attachment of that error to land or an entitlement means that it is potentially possible for no payment to be deemed to be finally correct. Many instances were found where a case had both underpayments and overpayments. This is exacerbated in SPS by the existence of overlapping time cycles for different parts of the process, so that relevant information can change during the calculation of payments.

The ongoing procedural changes in reaction to external pressure and attempts to improve performance levels are also indicative of a failure to establish working practices at a fixed point. The ongoing procedural and management changes typified as reactive tactical management were one of the largest identified causes of poor performance identified during the RCA exercise. This caused processing not to be stable as work practices and skill levels were not able to respond appropriately.

The potential for an error on a traded entitlement or land to be passed on to the next recipient meant that no payment, even if correct at the time it was made, was guaranteed not to subsequently change on identification and correction of the error in the future indicating another area of potential dynamism. The annual changes to commons register and valuations had a similar impact on payment accuracy, in that a change would affect all commons holders, possibly over multiple years.

9.5.3 Interconnectedness

The wicked theme of interconnectedness suggests that problems and instances are interconnected, and symptoms of other problems, and that it is difficult to identify causes and effects.

There is evidence of this theme within SPS operations. The RCA research indicated that causes of error had multiple connections, both with effects and with other causes.

Claims are connected to each other by two mechanisms: through the transfer of land or entitlements which are carrying errors, and through the annual valuation exercise in which the cash value of a claim is dependent on the number of valid claims in that year.

There is interconnectedness across time: each year is connected to all the others both forwards and backwards, so that an error identified in one year may affect all other years.

9.5.4 Intervention has consequences

In wicked terms this is a feature that indicates that interventions are not trivial and have consequences, some of which will be unintended, and that interventions cannot be tested, and represent a one shot operation. The operational implications are that an error and its correction have ongoing consequences, identified or not.

There is evidence of this theme within SPS operations. The reactive management tactics of changing procedures regularly was an attributed cause of poor performance. In view of the annual nature of the scheme and the long cycle of the processing period meant that these changes were not testable and could not be reversed if they did not improve performance.

The absence of a single identifiable root cause for poor performance, and the interrelated nature of the causes and effects means that it would be impossible for any particular intervention to not to have unintended consequences.

The initial setting up of the scheme, both the choice of the dynamic hybrid scheme, and the errors to all databases introduced during high volume data collection had ongoing consequences for processing in all subsequent years.

Annual changes to commons entitlements, with subsequent potential for retrospective adjustments had impacts on multiple claims across a number of years.

Any change to improve the alignment of databases and to ensure in particular that the land database reflected fully the eligibility of the actual land would involve subsequent changes to any claim to which that land was related. This could involve multiple changes to multiple claims over multiple years.

The identification of an error at any stage of processing would lead to the particular case being returned to the beginning of the cycle in order to be reprocessed in full. That meant that the correction of an error was not a trivial intervention.

9.5.5 Uniqueness

The wicked theme of uniqueness emphasises the inability to learn from the experience of problem solving to enable the formation of a universally applicable and repeatable theory or methodology of design and improvement (Rittel and Webber, 1973). In an operational sense it would indicate the following: each item being processed would both be different and require different treatment; it would not be possible to create one process to deal with either the whole set of claims or a subset, or develop and apply a generalisable solution. It could be considered that every incoming claim represents a "problem", the solution to which can be described as a series of actions and decisions resulting in the right payment to the right claimant at the right time.

It is argued that in the 20 cases each presented differently; although there were common themes which emerged (e.g. HVDC) no case was exactly similar to another in the nature, causes and effects of its errors. The inability of SPS to deal with some combinations thus causing poor performance is however another indication that the possibility of these combinations had not been included in the original design of the operation.

There is another sense in which it is argued that SPS is unique at the level of its overall design. The features of the interconnected nature of all the claims in determining individual values in an overall valuation exercise, the annual nature of the scheme, the open ended nature of each claim through time and the desire for 100% accuracy over a number of years rather than a more pragmatic approach causes SPS to pose a potentially unique operational and management challenge.

9.5.6 Planner's responsibility

Planner's responsibility has been operationalised as evidence that the "planner" is taking ownership of the situation. It was not part of this exploratory exercise to consider the motivation or the responsibility of those engaged in either the choice of a complicated dynamic hybrid scheme or operational design of SPS, since the research was directed towards operational performance. A short discussion on planner's morals is set out in chapter 10.6.1.

9.5.7 Diagrammatic representation of wicked themes.

In this section we will seek to locate the themes within the SPS transformational process.

The SPS process flow is located in the Business Process Architecture (Chapter 6.3.3) and in particular the activity sets A3, A4, A5; (being respectively "Upload data and perform OLV", "Resolve my events tasks", and "Make Payment").

These activity sets, beneath the top level activity, represent the process of receiving and validating an input form, gathering information and making necessary corrections, reviewing the claim against current land and entitlement data, making corrections resulting from or in adjustments to earlier payments and resolving payment errors, some of which will affect other historic claims, calculating the value of claims in total and making payment. These clearly represent the more generic steps of: "receive input form", "gather information", "assess claim", "calculate value", and "make payment".

We have located the themes in more than one stage of the SPS process. For example within SPS there are multiple occurrences where interconnections affect processing. The connections are due firstly to the annual valuation exercise which effectively creates a batch of one in which all claims need to be processed together to enable a fixed sum to be allocated amongst eligible claims. They are also connected through the sale of land and entitlements, which creates a network of potential adjustments if errors are subsequently identified.

The claim cycle is an annual process. Claim forms are produced annually during the current year cycle for input to the system in the next claim cycle. The annual nature of the scheme and sale of entitlements or land mean that claims from different claimants are now interconnected, and that changes to one claim may affect others. Any intervention to correct errors e.g. in the land database and improve alignment will have significant consequences in the recalculation of payment amounts over multiple years and possibly multiple claimants.

The non alignment of databases leads to difficulty in assessing correctness of payment, based on differing information, causing multiple explanations for correct claim value.

The changing nature of the information required to calculate claim values on an annual basis contributes to this.

The annual nature of the scheme, and the potential impact of land changes on the payment calculation of multiple claimants means that payments, whenever made, are liable to change. Land data was constantly being revised. It is not possible to determine the correctness or optimum of any payment. Calculations for claim value could be changed for any claimant and any year.

We therefore propose that the wicked themes may be located within SPS processing as represented in Figure 9.1 below. These are represented in the model as M (multiple explanations), S (no stopping rule), C (interconnectedness), I (intervention has consequences).

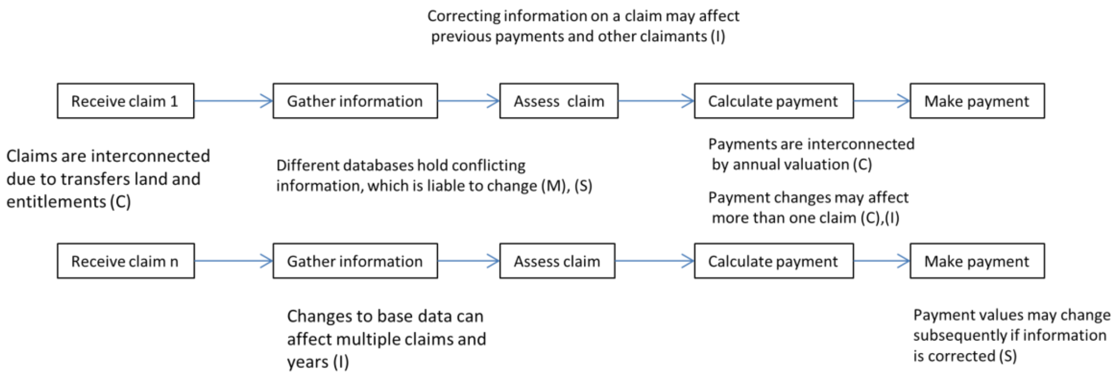


Figure 9.1 Location of wicked themes within SPS processing

An analysis in chapter 3 (Figure 3.1), similarly located the properties in the various stages of the problem solving process and proved a stimulus to the development of the themes underlying the properties of wicked problems. This model can be seen as analogous to Figure 3.1. Figure 3.1 indicates how the properties of a wicked problem according to Rittel and Webber impact on a typical problem solving process. The wicked properties can be identified as acting in multiple stages of the process, often in tandem with other properties. These interactions contribute to the insoluble and wicked nature of the problem.

Similarly, Figure 9.1 shows how the wicked themes or characteristics identified empirically from the research data act on the SPS claim payment process. The themes can be seen to impact in multiple stages of the process, and are often act in each stage in combination. Taken together the themes contribute to SPS being a wicked operational problem. Being able to locate themes in this way enables the early identification of the operational process as possessing wicked characteristics.

9.6 Contribution

This research has been based around the major themes of wicked problems, OM and systems thinking and approaches. The existing literature involving the use of wicked problems centres around the location of such problems in large societal contexts where systems based methods of managing discourse among different or opposing viewpoints was deemed to be necessary. Empirical research using wicked problems as a basis within an operational environment is extremely limited. We identified that the use of reductionist techniques within OM are being challenged as contexts become more complex requiring more systemic approaches to be adopted.

9.6.1 Wicked problems.

The 10 properties of wicked problems put forward by Rittel and Webber are based in the context of planning and design, and indeed their original purpose in writing the dilemmas was to challenge the possibility of developing general theory for design and planning. They suggest that the dilemmas had “societal” impact, and some properties of wicked problems have social meaning directly attached to them i.e., the planner has no right to be wrong, and solutions are not true / false, but right / wrong.

Deriving themes from the properties of wicked problems and their accompanying narrative enables a more general view to be taken of the issues contained within wicked problems and enables a wider sphere of application, especially into operational areas.

It is suggested that wicked problems are large and societal, and that interventions have significant impacts, which take effect over many years (Rittel and Webber, 1973). The exact nature of “large” and “significant” is however not properly discussed. A reference is made in the eighth property that the larger the boundary is drawn, the bigger the problem becomes. No discussion is attempted on what the minimum size of the boundary and hence the enclosed system needs to be. This research suggests that a boundary containing an operational system such as SPS is able to contain a wicked problem. The significance of the impact should be related to the scale of the problem and the intervention being considered (Smith, 2005).

9.6.2 Empirical work on wicked problems

The limited existing empirical research in an operational context has used the 10 properties as its basis and has used a very restricted methodology in justifying its conclusions (Kesavan et al., 2009, Klinzing, 2010). This research has extended that in two ways. It has established themes that are more relevant to an operation than the characteristics proposed by Rittel and Webber, and it has used a rigorous, extensive and comprehensive methodology to demonstrate empirically the existence of wicked themes, enabling the process to be described as a wicked operational problem. It has also shown the relationships between these characteristics in contributing to a wicked operational problem, as demonstrated in Figure 9.1.

9.6.3 Operations Management

This research responded to more calls to use in-depth analysis of operations (Hill et al., 1999), and systems approaches (Sprague, 2007).

OM research is considered to lack theory; for example Schmenner and Swink (1998), put forward two proposals as potential underpinnings for theory: the performance frontier, and swift even flow. The performance frontier lacks specifics on operational performance or improvement techniques, and the concept of swift even flow is compromised by the characteristics of wicked operational problems especially their interconnected and dynamic natures. We would argue that swift even flow and similar applications e.g. Toyota Production System are limited in application to tame problems.

As we have seen systems thinking applied to OM has taken the following reductionist and deterministic forms: Hard OR, Complexity, and System Dynamics, depending on the location of the problem within a simple or complex typology (Jackson, 2003). The realisation that these approaches were not applicable to all types of problem, especially those multiple viewpoints such as “messes” and “wicked problems” stimulated the growth of pluralistic systems approaches. The identification by this research of the characteristics of wicked problems within an operational context has implications which might limit the applicability of deterministic techniques in all operational contexts.

The research employed a systems based approach involving systems concepts of structure, behaviour and relationships between the parts to understand and analyse in depth an operational process performance problem. Using System of System Methodologies as our reference base, characteristics of wicked problems have been located within a broadly functionalist viewpoint and context, rather than an interpretive one. This research does not challenge the use of interpretive Systems Approaches, such as the various Problem Structuring Methodologies, in pluralistic situations, but it indicates that there is no requirement for the existence of a wicked problem to be solely located within a social context.

9.6.4 Alternate Potential Approaches

The adoption of a more explicit system approach to the case would have resulted in attempts to "solve" the problem of SPS through a systems methodology and intervention. We accept that had we planned an intervention systems approaches such as Total Systems Intervention (Flood and Jackson 1991) or Critical Systems Practice (CSP), (Jackson, 2003) could have been adopted. In Critical Systems Practice a pluralist approach is adopted, in which multiple tools and methodologies from many different paradigms, as described in the system of system methodologies (SOSM) in chapter 2.4.4, may be used, providing each tool set is recognised as attaching to a particular paradigm and is used correctly within the meaning and scope of that paradigm. Methodologies and tools may be used consecutively or even concurrently but not mixed. The paradigms used in SOSM are functionalist, interpretive, emancipatory and post modern, although one will tend to be dominant depending upon the view taken of the problem situation (Jackson, 2010). Intervention is then based on the use of the chosen methodology.

Such an intervention was not however the intention of this thesis. Rather it was an attempt to explain, characterise and understand the nature of an operational problem which had proved immune to exhortations and previous attempts by its management to improve its performance. This understanding was achieved through the frame of wicked problems, using themes developed form the properties of such problems described by Rittel and Weber (1973).

It is never possible, or at least it is extremely difficult, to prove a negative. Thus it would be an overstatement to describe the operational performance of SPS as insoluble using the accepted methods of OM. However we agree with Flood that there is a class of problems that are “intractable” (Flood, 1999). We have used these thesis to demonstrate that membership of that class is not limited to problems that are purely social in nature.

9.6.5 The nature of the SPS problem

Systems approaches are in the zone of organised complexity, where there are strong interrelationships between elements. The structure and the behaviour caused by these relationships may be described as complex and often unpredictable. “The study of complexity and uncertainty is most often associated with system thinking” (Flood 99, p247).

We need to consider at this point whether SPS was complex or merely “complicated”. The discussion around this issue is beset with the difficulty that in natural language usage these terms are confused. For example, the Oxford English Dictionary defines both as implying a large number of parts connected in intricate patterns. The natural language, colloquial version makes complex almost a synonym for complicated, or at least not simple, and often refers to structure, e.g. a wiring diagram or software program. To the “expert” such a structure may be a lot less complicated; leading to the observation that often complexity is in the eye of the beholder (Casti and Casti, 1994). The corollary of this is that what may look simple, or perhaps not worthy of further explanation to the non-specialist, may be “complex” in the right hands e.g. a stone may be simply a stone or conversely, broken apart it may contain a valuable crystalline structure. “In general we seem to associate complexity with anything we find difficult to understand” (Flood 1987 p177). Flood, using systems thinking as a basis suggests that we should better view complicated as the opposite of simple, and complex as the opposite of independent.

It has been readily argued that linear thinking, involving reductionism and causal determinism cannot be applied to complex problems (Cilliers, 1998). In extremis, the very language of “parts” and relationships may also be misleading and systems should be treated in their wholeness; reducing the whole to its elements will cause the relationship between the parts to be lost. "In holism the whole is the premise" (Jin, 2007, P398); it has "patterned integrity" (Davidson, 1983). There is also the connection with computational complexity and "NP" problems where there is exponential growth in the difficulty of solving the appropriate algorithm. Although some problems may in theory have solutions arriving at such a solution may consume so much resource that solving them becomes impractical (Flood, 1999).

The systems approach to complexity is a function of the relationship of the system being observed (the number of its parts and their nonlinear relationships) and people (the observers who have different interests, capabilities, perceptions and viewpoints) (Flood, 1987). Flood proposes that the presence of humans as observers adds a further relation to be considered in addition to the relationships between the parts of the system, adding to the complexity, and is clearly talking as much about structure as behaviour.

Complexity and chaos are often linked together. Complexity science can be referred to as the science of surprise or counterintuitive behaviour (Casti and Casti, 1994), which has developed in part from other strands of attempting to understand unpredictability, such as catastrophe theory. The mathematical version of chaos has rigour and unexpected meaning in which chaotic behaviour exhibits a degree of order and stability. Complexity theory would suggest that chaotic behaviour is caused by a deterministic system which is hypersensitive to initial conditions and small perturbations (Dooley and Van de Ven, 1999). Organisational studies of chaotic behaviour have tended to overemphasise the butterfly effect. This "obsession with chaos" has led to other patterns of behaviour, such as periodic or random being less well recognised as worthy of study and indicative of underlying structures that are of interest to management researchers.

Dooley and Van de Ven identify 3 patterns of behaviour, "periodic", "chaotic" and "random", which are caused by a combination of two factors, the dimensionality of the causal factors (high or low) and the nature of interaction between the factors (independent or interdependence). Low dimensional causal factors and interdependent relationships cause chaotic behaviour (where the pattern is predictable but not the path), low dimensional factors and independent factors produce periodic behaviour (pattern and path both predictable), and high dimensional and interdependent systems produce random behaviour (both pattern and path unpredictable). The implication of this is that observed chaotic behaviour in a time series for instance should lead researchers to look for a causal theory where dimensionality is low and causal factors react with each other non-linearly. They call for more research in organisations where causal factors are not independent. Complexity is about emergent behaviour and dynamic non linearity arising from interdependence (Geraldi et al., 2011). We argue that SPS is an excellent example of this and exhibits complex behaviours.

9.6.6 Summary of contribution

We may summarise the contribution of this research as follows:

1. The derivation of six themes identified within the ten properties of wicked problems.
2. An identification, confirmation and expansion of 4 of the themes within an operational environment in an exploratory case study. This provides evidence that some operation problems contain elements of wicked problems.
3. The development of a model from these results showing how the relationship between the themes impact on an operational process.

9.7 Concluding Remarks

This chapter has brought together the findings from the empirical investigation into the structure and behaviour of SPS and the wicked themes developed and operationalised in chapter 3, which were derived from the properties of wicked problems proposed by Rittel and Webber (1973). This is so that we can directly address the research question "what are the characteristics of a wicked operational problem?"

The synthesis has evidenced through the empirical studies the 4 themes that are most relevant to an operation; i.e. Multiple explanations, No stopping rule, Interconnectedness, and Intervention has consequences. Together these four form the characteristics of a wicked operational problem. We noted that two of the themes were not testable directly during this exploratory study. That is we have been unable to find evidence for uniqueness directly given the nature of a single case study and also as a result of the limitations of the study we have been unable to evidence test for evidence of planner's responsibility. However, we will discuss the issues surrounding this theme in chapter 10.

A further contribution has been the identification of the stages during the operational process where themes occur, noting that multiple themes can occur at different stages throughout the process, often occurring in tandem and that it is these interactions that contribute to the wicked nature of the operational problem.

In the next chapter we summarise the research, discuss its limitations, and make suggestions for further research.

CHAPTER 10

IMPLICATIONS AND LIMITATIONS

10.1 Introduction

This chapter summarises the research, and its contributions. The research has implications for both theory and practice and these are discussed. The limitations of the research are discussed and opportunities for further research are put forward. Personal reflections on the research process are put forward, and some concluding remarks made.

This chapter is set out in the following sections:

10.2 Research Summary

10.3 Contribution to Theory and Practice

10.4 Limitations of this research

10.5 Suggestions for further research

10.6 Planner's responsibility

10.7 Reflections on the research process

10.8 Concluding remarks

10.2 Research Summary

This research began by considering the nature of Operations Management (OM) and the types of issues and problems it addresses. Current research in OM recognises that its domain is expanding and the problems facing it becoming more complex, for which the prevalent reductionist techniques may not be appropriate. The research continued by reviewing the basis of systems thinking and approaches, and how these had influenced the development of OM.

A variety of problem typologies were examined, one of which, wicked problems, was identified as providing a fuller description and analysis of complicated problems. The characteristics of wicked problems in a complex environment act together to prevent adequate identification of the problem and its solution, and also impact on the subsequent implementation.

The literature using wicked problems as a frame was found to be primarily focussed on large social issues, planning and design. The empirical application of an analysis based on the underlying qualities of wicked problems was found to be limited and rudimentary, and lacking in a clear methodology. Following an analysis of the themes underlying the properties, a research objective was developed to explore the applicability of these themes to operational areas.

The empirical data collection was conducted using an extended single case study in an organisation which was experiencing performance issues and had been described as a "masterclass of maladministration". A systems based approach to identifying the causes of this poor performance was employed based on a detailed examination of the organisation's structure, process and behaviour. The data was then analysed against the themes derived from the properties to address the research question: what are the characteristics of wicked operational problems?

As set out in Chapter 1, this research, within the primary context of OM, ends at the stage of analysis of the problem situation. Alternate methodologies could have been applied during this research developing the systems thinking background into a more explicit interventionist change agenda, possibly employing for example pluralist approaches suggested by Jackson (2010). This would have led to engagement with other non-functionalist paradigms, and included actors within SPS and its wider environment of RPA and Defra. This research however deals with the nature of the operational problem.

10.3 Contribution to theory and practice

10.3.1 Contribution to theory

We may summarise the contribution of this research as follows.

The examination of the properties of wicked problems allowed the derivation of six underlying themes which were operationalised to enable empirical testing. This was carried out within an operational environment in an exploratory case study. Analysis of the case study provided evidence of the characteristics of wicked operational problems. Finally a model was developed from these results locating the themes within an operational context. The four wicked themes confirmed empirically by the SPS data were "interconnectedness", "multiple explanations", "no stopping rule", and "intervention has consequences". The model demonstrates how the themes interacted at multiple stages on the SPS process to cause a wicked operational problem. The interconnectedness of inputs, where all claims were linked both by the need to be processed together and where changes to one claim could affect others during processing, is one feature. Another is the non alignment of information databases and actual land, which allows for multiple and changing explanations and calculations of a payment, with no clear view on correctness. Actions to correct information or align the databases had significant consequences in changing already established payments among multiple payments and over multiple years, causing instability in payment amounts and the inability to calculate a correct payment, leading to the absence of a stopping rule.

Churchman described a wicked problem as belonging to a class of problem which is "ill formulated...[the] information is confusing....there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing" (Churchman, 1967, pB141). He continued by wondering about the extent of wicked problems, surmising that the non wicked problems may be limited to the "arena of play: nursery school, academia and the like" (pB141).

By analysing the essential themes of wickedness such as interconnectedness, multiple explanations, no stopping rule, and the consequences of intervention, and locating them within an operational process, we have been able to extend the generally accepted applicable domain beyond social, planning and design problems to operations.

This research also contributes to OM through identifying the existence of wicked problems within an operation, indicating that the effectiveness of existing techniques for dealing with operational problems may be contingent on the extent of wickedness within the operation. This has the potential to make a major contribution to that discipline, challenging the reliance on 'one size fits all' approaches to Operations Improvement.

10.3.2 Contribution to practice

The potential contribution to practice is to provide managers and those charged with improving operational performance a means to identify wicked operational problems. This will enable an improved awareness and understanding of the nature of problems, and impact of problem types and will increase the potential for identifying the appropriate technique when dealing with such operational problems.

Management and especially OM is a "messy domain" (Sprague, 2007, p236). We would argue that dealing with "problems" is one of the key activities of operational managers. Jackson (2003) says that it is possible to apply reductionist and "fad" ideas to management problems, but that it is probably more appropriate to apply systems thinking approaches, given the difficulty in applying linear thinking to complex non linear problems.

The potential for this more systems based approach to identify the characteristics of wicked operational problems and their effects on operational processing may be illustrated through an interview conducted at the end of our research with the Chief Operating Officer of the RPA, responsible for SPS. This interview indicates that reductionist techniques that had been applied and continued to be applied as a means to "fix" the operational problems of SPS were not having the desired impact. The reductionist methods missed the systemic and wicked nature of the operational problem. Comparing the operation to a car assembly line he described the operational difficulties thus: "no sooner had you produced output while you're still trying to change the design with the new cars going through, you've got an old car coming back through the production line to repair. ... It's like the output was connected to the input and you were... on a circle" This clearly demonstrates the effect that the themes of interconnectedness and no stopping rule were having on the operation, in that processing of cases became a circular activity. The discussions on wicked operational problems as the research progressed led him to eventually raise this within Defra and the government. He noted that "statements had been made to parliament which actually says 'this is a long and difficult one'. It doesn't quite go to say 'it's not fixable' but actually that is what the statement says."

10.4 Limitations of the Research

10.4.1 Limitations of a single case study

The limitations of a single case study are the difficulties of forming generalisable conclusions and of forming generalisable theory (Siggelkow, 2007). These limitations are offset both by the richness and exposure to an operation that as single case allows (Hill et al., 1999), and by the learning from a single case which has the ability to create contextual and temporal analyses useful in building conceptual models necessary for theory building (Meredith, 1993, Meredith, 1998). This research is exploratory in nature, and thus not at this stage intended to be generalisable.

10.4.2 Alternate explanations and approaches

It might be argued that SPS is merely an example of an IT development project experiencing difficulties within a public service organisation (Silvestro and Silvestro, 2003). It is accepted that IT systems and software development do not have high levels of performance (Mahanti and Antony, 2005). However our research clearly shows that the IT systems were not the only cause of the performance problems.

There is a wide range of system approaches to problem analysis and solving that could have been used within the functionalist paradigm. We have chosen to research SPS performances using an essentially qualitative approach in which the configuration and relationships of the parts is more apparent (Hensley and Utley, 2011). Alternate methods within the functionalist paradigm such as systems dynamics and complexity theory, essentially mathematical modelling techniques, share the methodological difficulty of testing developed models to reality (Bertrand and Fransoo, 2009, Van Der Zouwen, 1996).

Within the discipline of systems thinking and potential approaches, we have restricted ourselves to a functionalist approach examining the performance of SPS, in particular its structure and behaviour. The application of "wicked problems" is more common within the interpretive and emancipatory paradigms where multiple viewpoints lead to the need for pluralistic approaches to resolving essentially social problems. Given that the nature of this research was to examine the applicability of analysis derived from wicked problems to an operational context, it is considered that this approach is the most appropriate.

10.4.3 Pluralist approaches

The contribution of this thesis to OM is clear, and has been set out above. The findings however, of the existence of a wicked problem at an operational level rather than at a social level, i.e. at a level in which people who carry with them different world views and hence multiple viewpoints exist, could contribute to current practical views on systems thinking and systems practice or intervention.

This particular systems thinking "lens" was discussed in detail in Chapter 2 but an intervention was not pursued in this case study. We chose to frame potential interventionist methods using Jackson's (2003) System of Systems Methodologies in which systems approaches are positioned according to the perceived degree of complexity of the problem (situation), the degree of plurality of viewpoints of the participants, and the paradigm or world view adopted by the practitioner.

Jackson's later work (2006, 2010) suggests using Critical Systems Practice, an interventionist approach in which multi – paradigmatic methods are used to provide more appropriate and complete solutions to a perceived problem situation. The potential contribution of this research to a more pluralist systems practice, associated with an increased focus on the actors and their viewpoints within SPS, and a wider consideration of the boundaries within which SPS operated, could have been to apply CSP and hence test its applicability in a case where the operational problem was not amenable to the standard operational improvement methods, such as OR, lean or six sigma which would have been suggested by CSP when employing a dominant functionalist paradigm.

10.5 Suggestions for future research

10.5.1 Empirical studies

As noted in the limitations section above, this research has been based on a single case study. More research in other situations and contexts, of organisations in which operational problems are being exhibited or experienced needs to be performed in order to challenge these findings. In particular, research would be valuable to determine the experience in the other countries which introduced the dynamic hybrid scheme, and to further explore the nature of planner's responsibility in wicked operational problems.

10.5.2 Service and wicked problems

We may define service as an open system in which the customer has significant presence or input, and is effectively "thrown into the works" (Frei, 2007). The presence of the customer in the service operation indicates both a subjective experience and the inevitability of multiple interpretations in the transformation, outcome and ongoing co-creation of value (Vargo and Akaka, 2009). This indicates that an area of exploration for wicked operational characteristics would be in service systems where they might be more evident than within closed operational systems which exclude the customer (Thompson, 1967). There have been repeated calls for more systems based research in services (Ng et al., 2012), where there is a greater chance of uncertainty, interconnectedness and unexpected outcomes (Badinelli et al., 2012). This suggests an excellent opportunity to examine the extent to which service operations possess wicked qualities, and upon what any wickedness might be contingent.

10.5.3 Fuzzy logic and wicked problems

We have identified in this research the binary nature of many of the descriptions encountered in the literature: e.g. hard/soft, ill structured/well structured, tame / wicked and of expositions based on ideal types such as simple/complex. It is also clear that the nature of each of the properties of wicked problems is also binary (e.g. either there is a stopping rule or not). The empirical work was unclear as to whether there were degrees of wickedness, and how many properties were required for a problem to be called wicked. Indeed in our own analysis we used evidence of the existence or otherwise of the wicked characteristic to describe wicked operational problems, and were not able to deal in degrees.

Traditional logic tends to deal with "either or" statements which sets up binary opposites (e.g. right / wrong) through the law of excluded middle. "Fuzzy" logic on the other hand deals not in probabilities but of degrees of a quality or a number of qualities (Kosko, 1994), and possibility and necessity (Badinelli, 2012). The application of fuzzy logic, which deals with representations of variables possessing vagueness and ambiguity, long established in engineering control mechanisms, is being increasingly explored in service encounters (ibid.). Fuzzy logic may provide an opportunity for a different taxonomy of problem types, and enable improved understanding of how wicked operational characteristics contribute to performance issues.

10.5.4 Requisite variety and wicked problems

Ashby's law of requisite variety states that only "variety can destroy variety" (Ashby, 1964). This is based on an input output model in which an input or disturbance (D), is transformed or managed into a satisfactory outcome (E) by a combination of the operational transformation (T) and its regulator (R). If the variety in the input cannot be recognised, dealt with and absorbed by the combination of T and R the outcome is unlikely to be satisfactory. This simple cybernetic model is the basis for the later viable systems model developed by Beer (1979). Further work needs to be carried out to operationalise the concepts of the Ashby model (Godsiff and Maull, 2011). The potential existence and effect on expectations of outcome of more than one regulator as will occur in a service encounter needs to be explored (Godsiff, 2010). The characteristics of a wicked operational problem, in particular multiple explanations or viewpoints, and no stopping rule, have implications for the management of variety in an operation in which variety may be increased during processing rather than decreased as in the standard expectation. The combination of wicked operational problems and the Ashby model needs to be explored in greater detail to determine potential synergies.

10.6 Planner's responsibility

We identified a theme in Chapter 3 of "planner's responsibility" which we operationalised as the planner taking ownership of the situation. We have been unable to test empirically for this theme in this exploratory case study. The theme is based on discussions around the tenth wicked property (Rittel and Webber, 1973) which states that "the planner has no right to be wrong" ; and "planners are liable for the consequences of the actions they generate", and is reinforced by property three which suggests that solutions are good or bad rather than right or wrong, and property two which suggests that the "planner can always try to do better".

It is likely that Rittel and Webber intended this to be an internal moral imperative. The moral responsibility may of course be to not disguise a wicked problem as a tame one, for which a permanent solution is available, and thus mislead the stakeholders (Churchman, 1967). Churchman explores this by suggesting that the role of Operations Research is to "tame the growl" of the wicked problem, potentially however, leaving however its "bite" intact. The moral responsibility remains with the planner. "Whoever attempts to tame a part of a wicked problem, but not the whole, is *morally wrong*" (Churchman, 1967, pB142, my italics). Referring to this moral dimension of wicked problems as a neglected issue, Wexler (2009) states that it places a requirement on the "planner" to place less reliance on easy solutions, the "silver bullet", and to concentrate on the parts of the problem which require continuing attention and effort.

The property can be turned back on itself and explored further by including within the analysis the ontology of problems and whether they exist independently of the observer. If they do not, then the problem itself cannot be wicked, and describing it as such creates a "scapegoat" when the true fault lies with the researcher/expert who is being "psychologically defensive" in blaming the "problem" for being insoluble rather than for their own inadequacies or inability to solve it (Bahm, 1975). Thus Bahm can be seen to agree with Churchman on the need for honesty on the part of the planner / expert in their dealings with stakeholders on the extent to which a proposed solution will be effective, but differ in their reasoning: Churchman preferring to blame the problem, Bahm preferring to blame the expert.

10.7 Personal Reflections

Research on and involvement in problem solving can prompt both personal change and the development of new methodologies. For instance Checkland, confronted by the limits of systems engineering and the functional paradigm, in addressing real world problems, originated an interpretive "soft systems methodology" as a response, which itself underwent further development (Checkland, 1999); Beer moved from cybernetics and control contained within the viable system model, a functionalist position, to team syntegrity, a way of managing discourse but within a controlled procedure, an example of the emancipatory paradigm (Jackson, 2003); and Taket and White moved from a functionalist paradigm to an avowedly post modern position (Taket and White, 1993).

Rittel and Webber themselves were faced with the possibility that scientific rationality might not be universally applicable and had reached its limits: "The Enlightenment may be coming to full maturity in the late 20th Century, or it may be on its death bed" (Rittel and Webber, 1973, p158)

"Case research enriches not only theory, but also the researchers themselves" (Voss et al., 2002). My reflections as a result of the research process are briefly as follows. From the starting point of a professional career, much of it involved in change and corporate development, the presence of change and problems surrounding change has been a constant challenge. This research itself has indicated that this is not a unique position, but that there are a wider range of techniques available than are usually known or accessed by practitioners. Personal exposure to soft systems methodology, during the design of a mortgage processing operation which was being assisted by one of the methodology's developers, demonstrated the benefits of one particular more structured approach, and can now be underpinned by a sounder theoretical base.

This research has revealed a wide variety of approaches to accessing reality and creating change. This case study remained mostly in a functionalist paradigm, which given the nature of the operational problem and its less social nature, predicated on the deliberate boundary we drew round it in just studying the operational processing, is valid. A different paradigm and method, involving the inclusion of pluralistic viewpoints and discourse management, would not have been appropriate. Practical experience of using SSM, and limited discourse techniques can now however be underpinned by a sounder theoretical base.

The research process, unlike most practice, is based on rigour, and building on existing knowledge. This method is designed, inter alia, to avoid two common management practices: "fad surfing" and being influenced by single dimensions of success, where cause is insufficiently identified (Rosenzweig, 2007) . This research has also provided a better understanding of problems, and their relationship to interventions and problem "owner", treated from a range of ontological and epistemological positions. The strength of a systems approach has been reinforced and my awareness of its strength and weaknesses has been greatly enhanced.

10.8 Concluding Remarks

Rittel and Webber suggest that intervention in a wicked problem will have unintended consequences, which will take a long time to work through - "a long half life". This is certainly true of the impacts and effects of the Common Agricultural Policy (CAP).

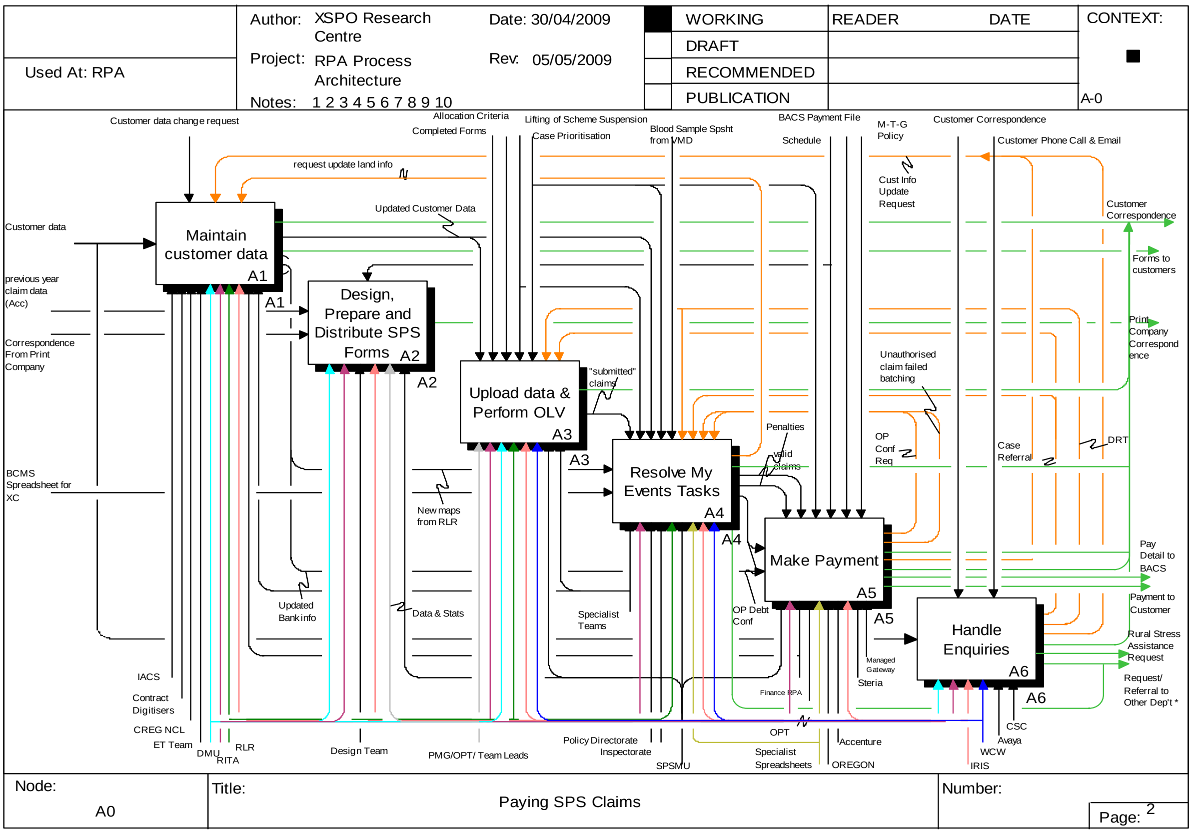
The main objectives of the CAP reform agreed in June 2003 which led to the introduction of SPS were to break the linkages between farm subsidies and production by decoupling direct crop based production subsidies and replacing them with a cross compliance scheme making subsidies dependent on meeting key standards in areas like environment, and animal welfare; this was an attempt to reform the existing CAP to keep expenditure within acceptable limits.

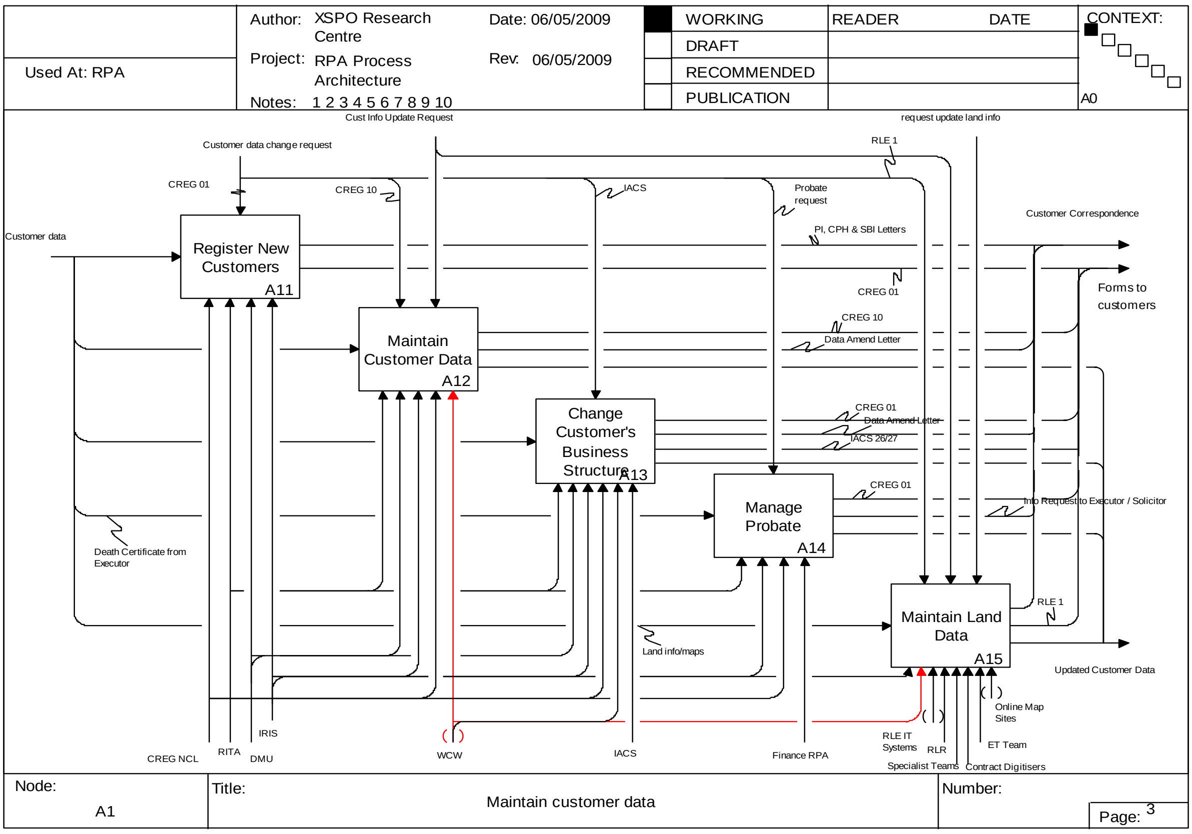
Checkland's observations on the CAP need to be borne in mind; although commenting on the difficulty of using the language of objectives in the "complexity of human affairs, his comments are equally well indicative of the impact of wicked problems:

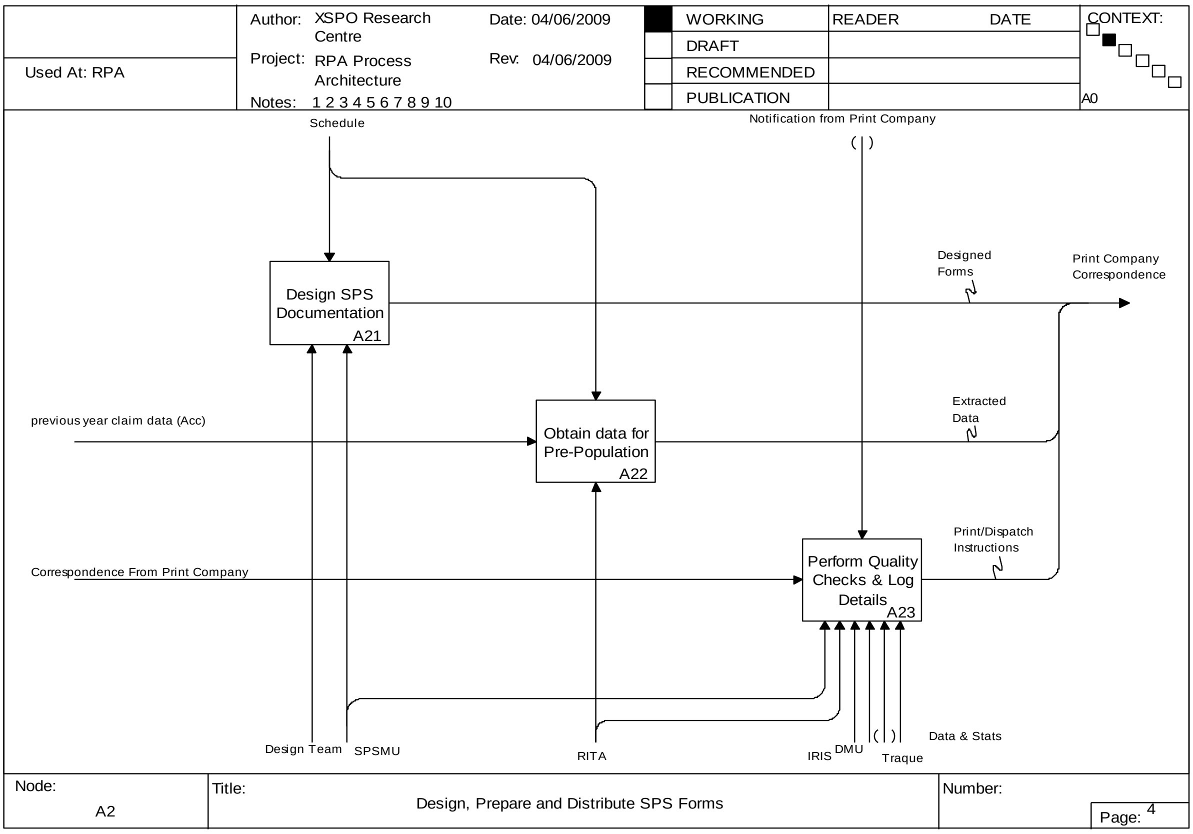
> "The Treaty of Rome boldly declares that the CAP has 3 equally important objectives: to increase productivity in the agricultural sector; to safeguard jobs in the industry; and to provide the best possible service to the consumer. No wonder the CAP is a constant source of never resolved issues: progress towards any one of its (equally important) objectives will be at the expense of the other two…..if you insisted on using the language of objectives you would have to conclude that the objective of the CAP is constantly to maintain a balance between the three incompatible objectives which is politically acceptable…" (Checkland, 1999, pA6-7)

Operations Management exists in a world of "booming confusion" (Van de Ven, 1999), in which rationality may not be easily obtainable (Rittel, 1972). The discipline tends to reductionism and lacks empiricism. What is required is a more thorough consideration of the nature and type of the problem before applying solutions, which might have saved the RPA considerable public embarrassment and opprobrium, had it done so.

APPENDIX 6A: IDEF0 MAPS OF SPS PROCESSES



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Project: RPA Process Architecture
Rev: 04/06/2009
DRAFT
RECOMMENDED
PUBLICATION
A0
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Schedule
Notification from Print Company
Designed Forms
Print Company Correspondence
Design SPS Documentation
A21
previous year claim data (Acc)
Obtain data for Pre-Population
A22
Extracted Data
Print/Dispatch Instructions
Correspondence From Print Company
Perform Quality Checks & Log Details
A23
Design Team
SPSMU
RITA
IRIS
DMU
Traque
Data & Stats
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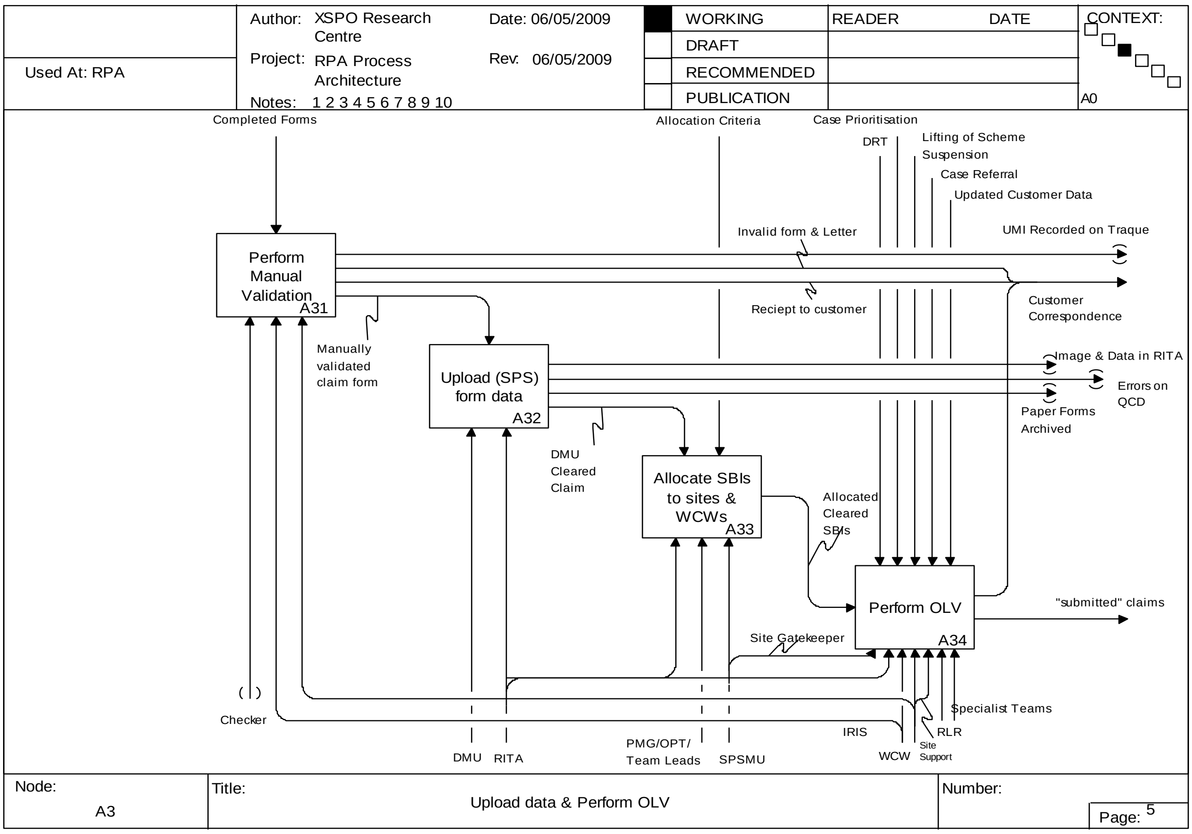
Title: Design, Prepare and Distribute SPS Forms
Number:
Page: 4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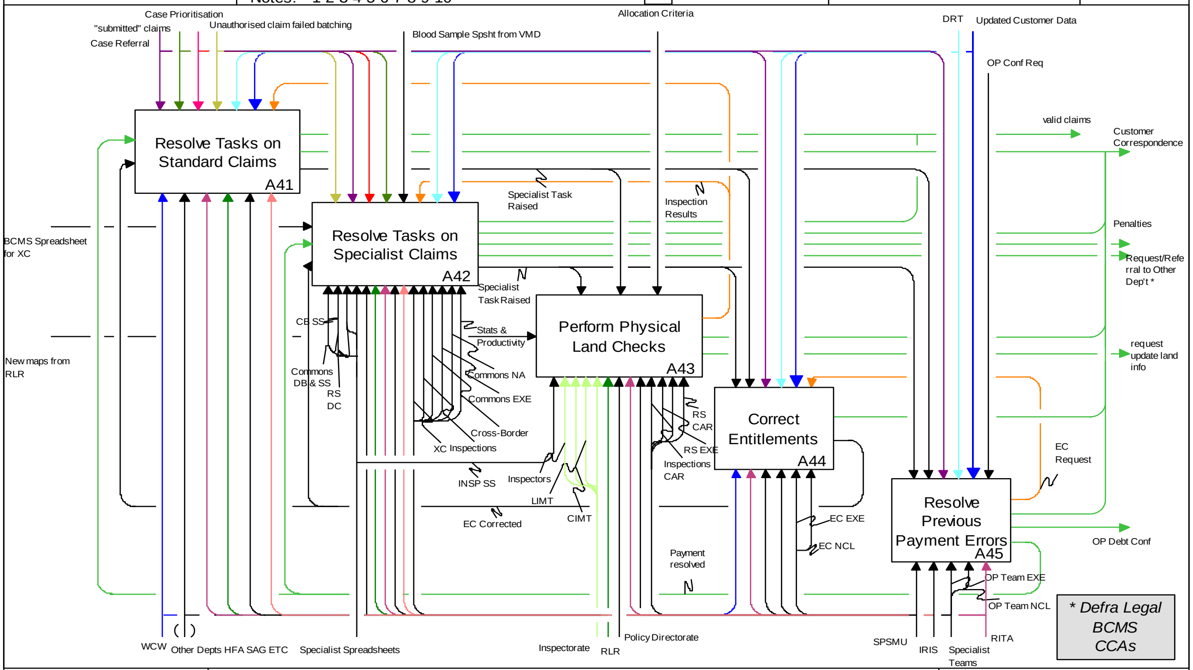
Rev: 06/05/2009
DRAFT
RECOMMENDED
PUBLICATION
A0
Notes: 1 2 3 4 5 6 7 8 9 10
Completed Forms
Allocation Criteria
Case Prioritisation
DRT
Lifting of Scheme Suspension
Case Referral
Updated Customer Data
Invalid form & Letter
UMI Recorded on Traque
Perform Manual Validation
A31
Reciept to customer
Customer Correspondence
Manually validated claim form
Upload (SPS) form data
A32
Image & Data in RITA
Errors on QCD
Paper Forms Archived
DMU Cleared Claim
Allocate SBIs to sites & WCWs
A33
Allocated Cleared SBIs
Perform OLV
A34
"submitted" claims
Site Gatekeeper
Checker
Specialist Teams
IRIS
RLR
WCW
Site Support
DMU
RITA
PMG/OPT/ Team Leads
SPSMU
Node: A3
Title: Upload data & Perform OLV
Number:
Page: 5

Used At: RPA	Author: XSPO Research Centre Project: RPA Process Architecture Notes: 1 2 3 4 5 6 7 8 9 10	Date: 04/06/2009 Rev: 04/06/2009	WORKING DRAFT RECOMMENDED PUBLICATION	READER	DATE	CONTEXT: A0



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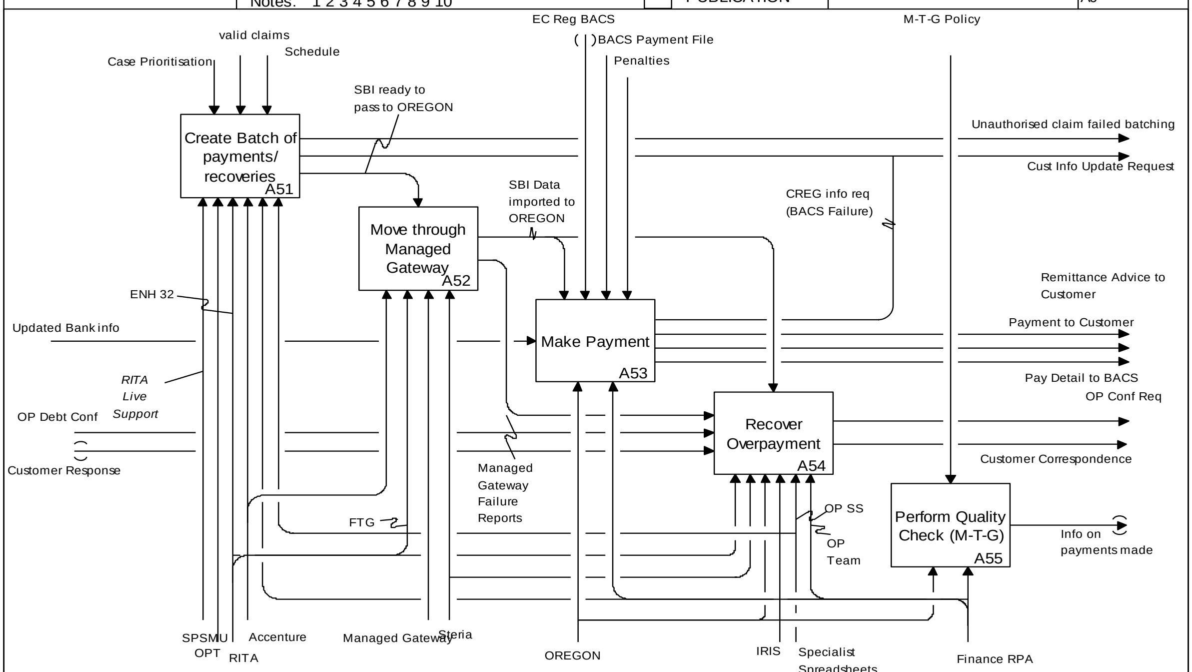
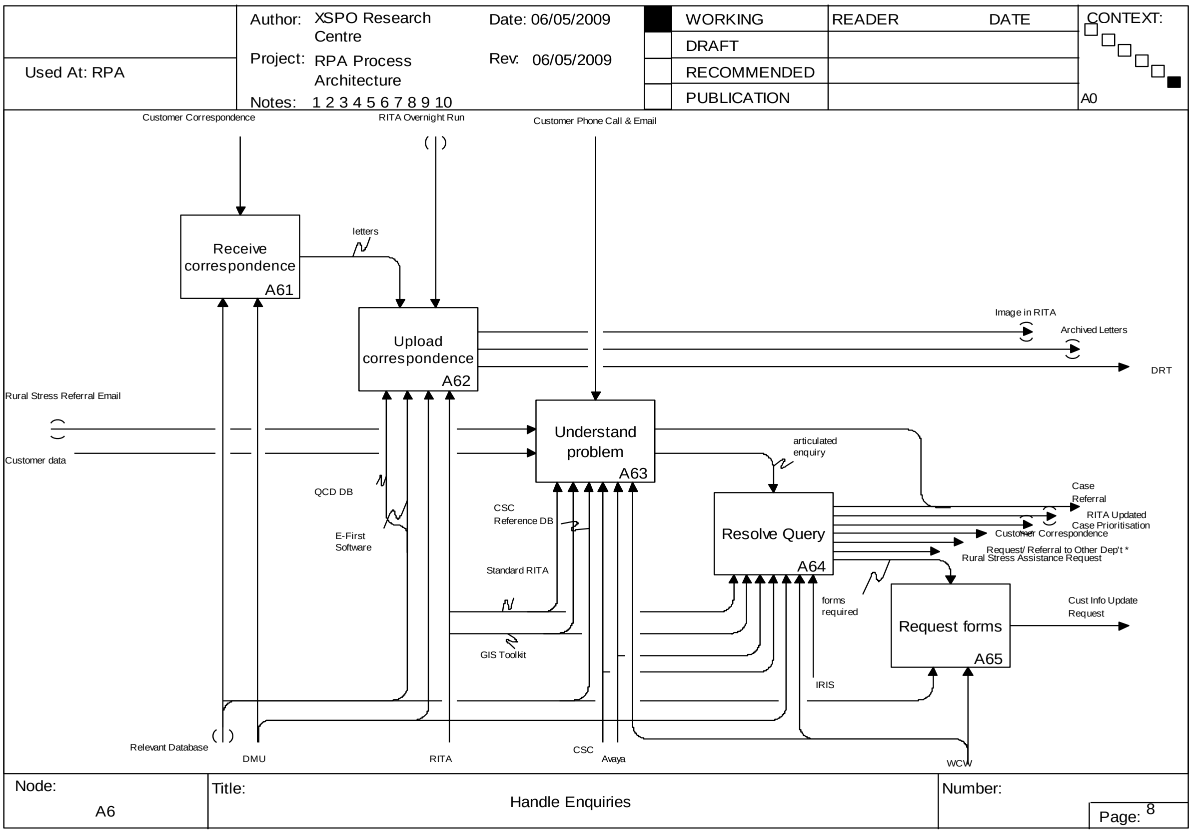


Node: A5	Title: Make Payment	Number:	Page: 7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Rev: 06/05/2009
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PUBLICATION
Notes: 1 2 3 4 5 6 7 8 9 10
A0
Customer Correspondence
RITA Overnight Run
Customer Phone Call & Email
Receive correspondence
A61
letters
Upload correspondence
A62
Image in RITA
Archived Letters
DRT
Rural Stress Referral Email
Customer data
Understand problem
A63
articulated enquiry
QCD DB
E-First Software
CSC Reference DB
Standard RITA
GIS Toolkit
Resolve Query
A64
Case Referral
RITA Updated Case Prioritisation
Customer Correspondence
Request/ Referral to Other Dep't *
Rural Stress Assistance Request
forms required
Request forms
A65
Cust Info Update Request
IRIS
Relevant Database
DMU
RITA
CSC
Avaya
WCW
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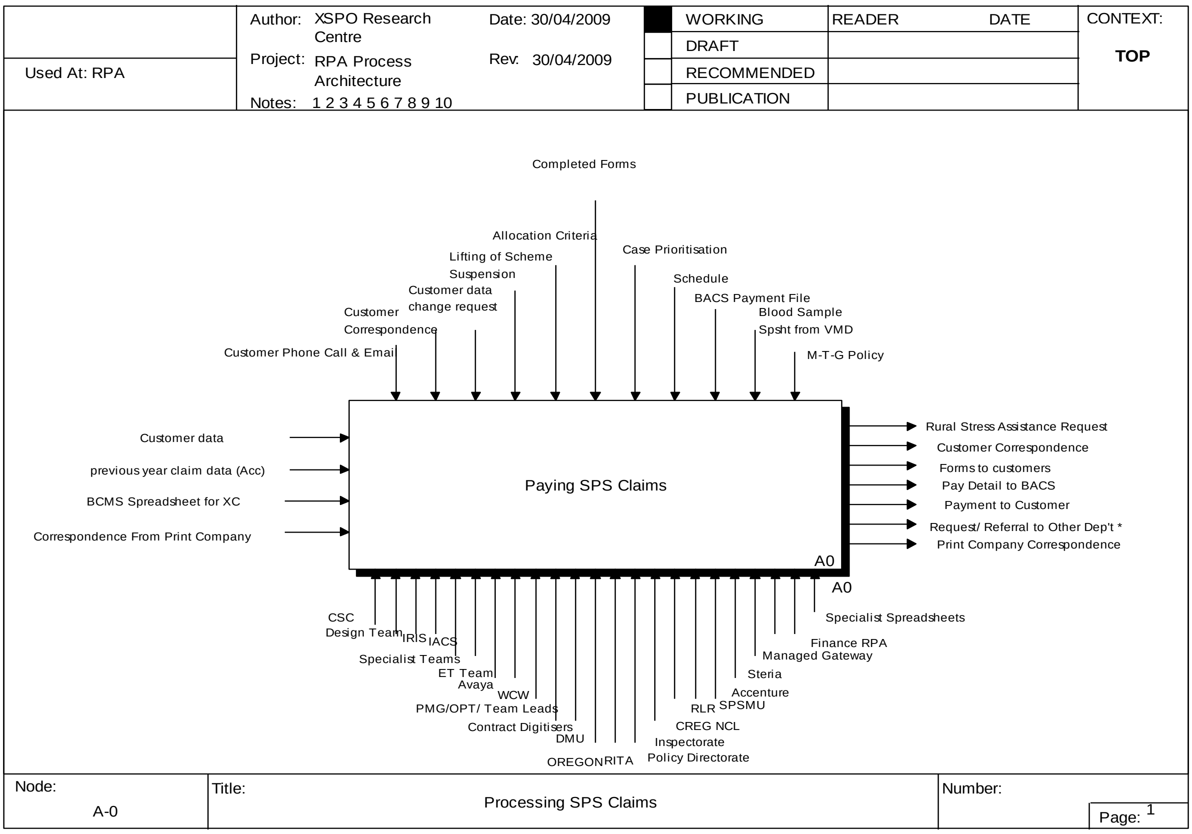
A6
Title:
Handle Enquiries
Number:
Page: 8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Rev: 30/04/2009
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TOP
Notes: 1 2 3 4 5 6 7 8 9 10
Completed Forms
Allocation Criteria
Case Prioritisation
Lifting of Scheme Suspension
Schedule
Customer data change request
BACS Payment File
Customer Correspondence
Blood Sample Spsht from VMD
Customer Phone Call & Email
M-T-G Policy
Customer data
previous year claim data (Acc)
BCMS Spreadsheet for XC
Correspondence From Print Company
Paying SPS Claims
A0
Rural Stress Assistance Request
Customer Correspondence
Forms to customers
Pay Detail to BACS
Payment to Customer
Request/ Referral to Other Dep't *
Print Company Correspondence
A0
CSC
Design Team
IRIS
IACS
Specialist Teams
ET Team
Avaya
WCW
PMG/OPT/ Team Leads
Contract Digitisers
DMU
OREGON
RITA
Specialist Spreadsheets
Finance RPA
Managed Gateway
Steria
Accenture
SPSMU
RLR
CREG NCL
Inspectorate
Policy Directorate
Node:
A-0
Title:
Processing SPS Claims
Number:
Page: 1

APPENDIX 7A: SAMPLE SELECTION FOR 150 CASE REVIEW

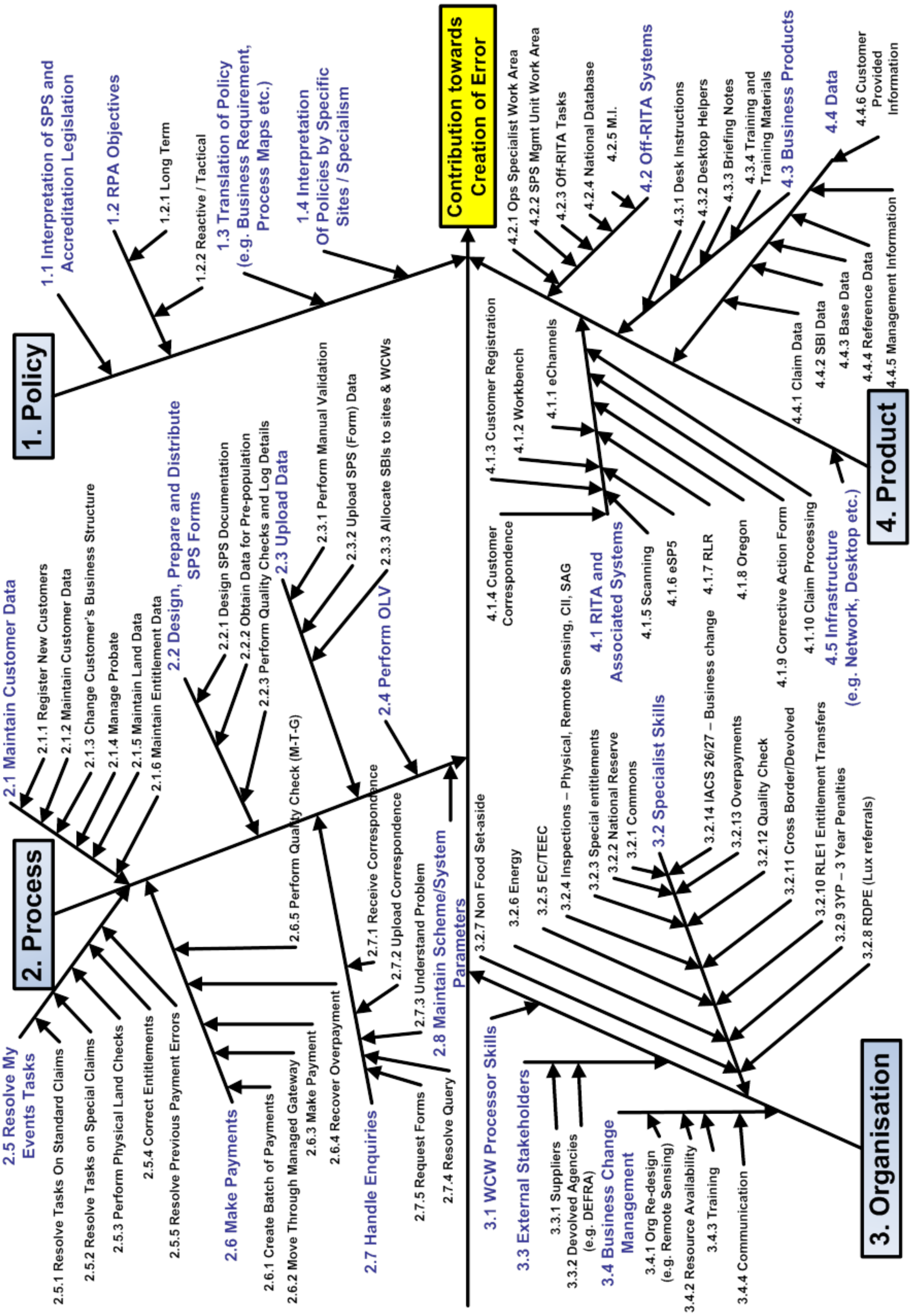
Error anomaly condition	Volume	% of subgroup population	Random sampled from representative sample
High Versions / Low interactions	4119	33.9	25
Low Versions / High Interactions	2256	18.5	14
One payment only and after deadline	74	0.6	1
Multiple payments before deadline	4226	34.7	26
Multiple payments after deadline	1503	12.3	9
	12178	100	75
CSP with EC	783	25.1	19
CSP no EC	1654	53.1	40
Appeals with EC	57	1.8	1
Appeals with no EC	155	5.0	4
Tail with EC	327	10.5	8
Tail with no EC	140	4.5	3
	3116	100.0	75

APPENDIX7B: CAUSE EVENT DIAGRAM ELEMENTS

	RCA Detailed Description	
1. Policy	1.1 Interpretation of SPS and Accreditation Legislation	1.1 Interpretation of SPS and Accreditation Legislation
	1.2 RPA Objectives	1.2 RPA Objectives
		1.2.1 Long Term
		1.2.2 Reactive/Tactical
	1.3 Translation of Policy (e.g. Business Requirements, Process Maps etc.)	1.3 Translation of Policy (e.g. Business Requirements, Process Maps etc.)
	1.4 Interpretation of Policies by Specific Sites / Specialism	1.4 Interpretation of Policies by Specific Sites / Specialism
2. Process	2.1 Maintain Customer data	2.1 Maintain Customer data
		2.1.1 Register New Customers
		2.1.2 Maintain Customer Data
		2.1.3 Change Customer's Business Strcuture
		2.1.4 Manage Probate
		2.1.5 Maintain Land Data
		2.1.6 Maintain Entitlement Data
	2.2 Design, Prepare and Distribute SPS forms	2.2 Design, Prepare and Distribute SPS forms
		2.2.1 Design SPS Documentation
		2.2.2 Obtain Data for Prepopulation
		2.2.3 Perform Quality Checks and Log Details
	2.3 Upload Data and Perform OLV	2.3 Upload Data and Perform OLV
		2.3.1 Perform Manual Validation
		2.3.2 Upload SPS (Form) Data
		2.3.3 Allocate SBIs to sites & WCWs
	2.4 Perform OLV	2.4 Perform OLV
	2.5 Resolve My Events Tasks	2.5 Resolve My Events Tasks
		2.5.1 Resolve Tasks On Standard Claims
		2.5.2 Resolve Tasks on Special Claims
		2.5.3 Perform Physical Land Checks
		2.5.4 Correct Entitlements
		2.5.5 Resolve Previous Payment Errors

	2.6 Make Payments	2.6 Make Payments
		2.6.1 Create Batch of Payments
		2.6.2 Move Through Managed Gateway
		2.6.3 Make Payment
		2.6.4 Recover Overpayment
		2.6.5 Perform Quality Check (M-T-G)
	2.7 Handle Enquiries	2.7 Handle Enquiries
		2.7.1 Receive Correspondence
		2.7.2 Upload Correspondence
		2.7.3 Understand Problem
		2.7.4 Resolve Query
		2.7.5 Request Forms
	2.8 Maintain Scheme / System Parameters	2.8 Maintain Scheme / System Parameters
3. Organisation	3.1 WCW Processor Skills	3.1 WCW Processor Skills
	3.2 Specialist Skills	3.2 Specialist Skills
		3.2.1 Commons
		3.2.2 National Reserve
		3.2.3 Special entitlements
		3.2.4 Inspections – Physical, Remote Sensing, CII, SAG
		3.2.5 EC/TEEC
		3.2.6 Energy
		3.2.7 Non Food Set-aside
		3.2.8 RDPE (Lux referrals)
		3.2.9 3YP – 3 Year Penalties
		3.2.10 RLE1 Entitlement Transfers
		3.2.11 Cross Border/Devolved
		3.2.12 Quality Check
		3.2.13 Overpayments
		3.2.14 IACS 26/27 – Business change
	3.3 External Stakeholders	3.3 External Stakeholders
		3.3.1 Suppliers
		3.3.2 Devolved Agencies (e.g. DEFRA)
	3.4 Business Change Management	3.4 Business Change Management
		3.4.1 Org Re-design (e.g. Remote Sensing)
		3.4.2 Resource Availability
		3.4.3 Training
		3.4.4 Communication

		RCA Detailed Description
4. Product	4.1 RITA and Associated Systems	4.1 RITA and Associated Systems
		4.1.1 eChannels
		4.1.2 Workbench
		4.1.3 Customer Registration
		4.1.4 Customer Correspondence
		4.1.5 Scanning
		4.1.6 eSP5
		4.1.7 RLR
		4.1.8 Oregon
		4.1.9 Corrective Action Form
		4.1.10 Claim Processing
	4.2 Off-RITA Systems	4.2 Off-RITA Systems
		4.2.1 Ops Specialist Work Area
		4.2.2 Other Off-RITA Databases
		4.2.3 Off-RITA Tasks
		4.2.4 National Database
		4.2.5 M.I.
	4.3 Business Products	4.3 Business Products
		4.3.1 Desk Instructions
		4.3.2 Desktop Helpers
		4.3.3 Briefing Notes
		4.3.4 Training and Training Materials
	4.4 Data	4.4 Data
		4.4.1 Claim Data
		4.4.2 SBI Data
		4.4.3 Base Data
		4.4.4 Reference Data
		4.4.5 Management Information
		4.4.6 Customer Provided Information
	4.5 Infrastructure	4.5 Infrastructure (e.g. Network, Desktop etc.)
		4.1.1 eChannels
		4.1.2 Workbench
		4.1.3 Customer Registration
		4.1.4 Customer Correspondence
		4.1.5 Scanning
		4.1.6 eSP5
		4.1.7 RLR
		4.1.8 Oregon
		4.1.9 Corrective Action Form
		4.1.10 Claim Processing


Contribution towards Creation of Error
1. Policy
1.1 Interpretation of SPS and Accreditation Legislation
1.2 RPA Objectives
1.2.1 Long Term
1.2.2 Reactive / Tactical
1.3 Translation of Policy (e.g. Business Requirement, Process Maps etc.)
1.4 Interpretation Of Policies by Specific Sites / Specialism
2. Process
2.1 Maintain Customer Data
2.1.1 Register New Customers
2.1.2 Maintain Customer Data
2.1.3 Change Customer's Business Structure
2.1.4 Manage Probate
2.1.5 Maintain Land Data
2.1.6 Maintain Entitlement Data
2.2 Design, Prepare and Distribute SPS Forms
2.2.1 Design SPS Documentation
2.2.2 Obtain Data for Pre-population
2.2.3 Perform Quality Checks and Log Details
2.3 Upload Data
2.3.1 Perform Manual Validation
2.3.2 Upload SPS (Form) Data
2.3.3 Allocate SBIs to sites & WCWs
2.4 Perform OLV
2.5 Resolve My Events Tasks
2.5.1 Resolve Tasks On Standard Claims
2.5.2 Resolve Tasks on Special Claims
2.5.3 Perform Physical Land Checks
2.5.4 Correct Entitlements
2.5.5 Resolve Previous Payment Errors
2.6 Make Payments
2.6.1 Create Batch of Payments
2.6.2 Move Through Managed Gateway
2.6.3 Make Payment
2.6.4 Recover Overpayment
2.6.5 Perform Quality Check (M-T-G)
2.7 Handle Enquiries
2.7.1 Receive Correspondence
2.7.2 Upload Correspondence
2.7.3 Understand Problem
2.7.4 Resolve Query
2.7.5 Request Forms
2.8 Maintain Scheme/System Parameters
3. Organisation
3.1 WCW Processor Skills
3.2 Specialist Skills
3.2.1 Commons
3.2.2 National Reserve
3.2.3 Special entitlements
3.2.4 Inspections – Physical, Remote Sensing, CII, SAG
3.2.5 EC/TEEC
3.2.6 Energy
3.2.7 Non Food Set-aside
3.2.8 RDPE (Lux referrals)
3.2.9 3YP – 3 Year Penalties
3.2.10 RLE1 Entitlement Transfers
3.2.11 Cross Border/Devolved
3.2.12 Quality Check
3.2.13 Overpayments
3.2.14 IACS 26/27 – Business change
3.3 External Stakeholders
3.3.1 Suppliers
3.3.2 Devolved Agencies (e.g. DEFRA)
3.4 Business Change Management
3.4.1 Org Re-design (e.g. Remote Sensing)
3.4.2 Resource Availability
3.4.3 Training
3.4.4 Communication
4. Product
4.1 RITA and Associated Systems
4.1.1 eChannels
4.1.2 Workbench
4.1.3 Customer Registration
4.1.4 Customer Correspondence
4.1.5 Scanning
4.1.6 eSP5
4.1.7 RLR
4.1.8 Oregon
4.1.9 Corrective Action Form
4.1.10 Claim Processing
4.2 Off-RITA Systems
4.2.1 Ops Specialist Work Area
4.2.2 SPS Mgmt Unit Work Area
4.2.3 Off-RITA Tasks
4.2.4 National Database
4.2.5 M.I.
4.3 Business Products
4.3.1 Desk Instructions
4.3.2 Desktop Helpers
4.3.3 Briefing Notes
4.3.4 Training and Training Materials
4.4 Data
4.4.1 Claim Data
4.4.2 SBI Data
4.4.3 Base Data
4.4.4 Reference Data
4.4.5 Management Information
4.4.6 Customer Provided Information
4.5 Infrastructure (e.g. Network, Desktop etc.)

APPENDIX 7C: ERROR CONDITIONS AND PRINCIPAL CAUSES

		Error Condition						
		Incorrect payments		Unnecessary work				
	Principal Causes	Multiple	Late	HighV	High I	CSU	Appeal	Tail
	Policy							
1.2.2	Reactive / Tactical RPA Objectives		10.6			83.5		
1.3	Translation of Policy	15.8	12.5				6.5	7.3
	Total	**15.8**	**12.5**	**0**	**0**	**83.5**	**6.5**	**7.3**
	Process							
2.1	Maintain Customer Data							10.1
2.1.4	Manage Probate							5
2.1.6	Maintain Entitlement Data							7.8
2.3.1	Perform Manual Validation						10.4	
2.3.2	Upload SPS (Form) Data				16.4			
2.5.4	Correct Entitlements	6.4						12.2
2.7.4	Resolve Query		5.4					
2.8	Maintain Scheme and System Parameters	5.5	11.8					
	Total	**11.9**	**17.2**	**0**	**16.4**	**0**	**10.4**	**35.1**
	Organisation							
3.1	WCW Processor Skills	5.4	6.4	15.1				
3.2.1	Commons Specialist Skills	8.9	11.5					
3.2.5	Entitlement Correction							13.4
3.2.8	RDPE (Lux) Referrals							5
3.2.13	Overpayments							7.5
3.4	Business Change Management			27.4				
3.4.1	Organisational Redesign		6.1		5.6			
	Total	**14.3**	**24**	**42.5**	**5.6**	**0**	**0**	**25.9**
	Product / Systems							
4.1.4	Correspondence				5			
4.1.10	Claim Processing	7.9			18.5			
4.3	Business Products			30.7				
4.4.3	Base Data	6.5						5
4.4.6	Customer Provided Information	7.8			30.2		83	
	Total	**22.2**	**0**	**30.7**	**53.7**	**0**	**83**	**5**

APPENDIX 8A: ERROR CONDITION OF 20 CASES CHOSEN FOR DETAILED REVIEW

Case number	Initial Error condition
1	Late payment
2	Late payment
3	Multiple payments
4	Multiple payments
5	Appeal with EC
6	Tail with EC
7	High versions low interactions
8	High interactions low versions
9	Multiple payments after deadline
10	Multiple payments before deadline
11	CSP no EC
12	Multiple payments after deadline
13	Tail no EC
14	Appeal no ec
15	Multiple payments after deadline
16	Multiple payments before deadline
17	Multiple payments before deadline
18	Late payment
19	Late payment
20	Low versions high interactions

APPENDIX 8B: CASES ANALYSIS

Case 1 (Late Payment)

In 2005 maps were sent to the claimant for confirmation of the size and use of land parcels. The claimant returned the maps, in which some eligible, claimable Arable land was not activated. By not activating this land, the claimant lost the ability to claim any of it in the future. No advice was given to the claimant that he was omitting the potentially eligible Arable land.

An illegal parcel (under the 0.1 size minimum) was created by the RPA from the detail returned by the farmer. This parcel was a segment of a larger field which should have been joined by the WCW, but was not.

In 2006, the pre-populated form was sent to the claimant containing the illegal parcel. The claimant activates his entitlements on the Arable land on his claim form. The claimant signs and returns the SP5 form.

The pre-population of the 2007 SP5 form drops/omits the pasture land that the claimant did not activate the year before. The claimant did not act to change/adjust this error.

The same year, the illegal, below-minimum parcel sent out in the 2006 pre-populated form was 'zeroed-out' by RITA, effectively dropping it from the claim. Dropping this illegal parcel also drops the overall size of the claim below the minimum claim threshold of 0.3. This triggers a penalty and disallowance in 2009 against this claimant, when the discrepancy is finally discovered.

Errors in RITA programming allowed a claim falling below the minimum total hectarage threshold (0.3), and the minimum field size (0.1) to be processed from 2007-2009.

In summary, this claim had a legitimate potential land size of 0.7 hectares, but through a series of technical errors, claimant errors, processor errors, and misunderstandings, the claimant was penalised and disallowed.

Case 2 (Late Payment)

In 2005, manual high volume data capture mistakenly captured a parcel value of 5.5 when in fact the actual value was 3.5. Upon investigation, the handwriting on the form was not perfectly clear and required closer inspection, but could be determined. This would later require corrective action.

The claimant also submitted parcel of 4.5 hectares which was determined in 2007 to be ineligible after an inspection. These actions led to Entitlement Correction to reduce the overall entitlements by the values described above, back to 2005. In 2008, the claimant transferred out all of their entitlements which created a small network of entitlement corrections to sort out. The entitlement reductions also triggered Overpayments investigations for those affected years.

It was these ongoing investigations which led to the delay of payment, after entitlement correction completed in late 2009. *Of note*: the claimant still submits a claim form with land but no entitlements, and therefore receives no payment on his processed claim.

<u>Case 3 (Multiple Payments, before close of payment window)</u>

Work was generated when the claimant submitted an altered 2008 SP5 claim form with a manual change in column 12 (*Area claimed for Protein, Energy, Nuts or HFA*). RITA rules dictate that if changes are made to column 12, the value in column 8 (*Eligible area on which to claim SPS*) must be reset and manually checked.

This check revealed a data pre-population error on that parcel. Final values for the 2007 claim matched the claimant's changes, but it appeared that a processor had changed the value for a short time. During that time the data extract for the pre-population was taken, which created the need for the claimant's adjustment on the 2008 SP5.

This, however, was not the reason for the multiple payments. The multiple payments were generated as a result of a Commons investigation, which included the land on this claim. The investigation resulted in adjustments to the value of the entitlements for the Common. These adjustments were extended back to 2005, and the cumulative adjustment was the source of the second payment.

In the claim documentation, there are no reasons or explanations given for what prompted the Commons investigation and the subsequent entitlement adjustments. This appears to be a regular occurrence in Commons processing.

<u>Case 4 (Multiple Payments, before close of payment window)</u>

<u>*Note:*</u> The descriptive state of this claim changed during the exercise. It was later determined that an additional payment was made after the close of the payment window, which would change this into a Late Payment case.

This is a Commons claim and all the adjustments to payment value (both top-up and recovery) result from changes made to entitlement values. Of note: nothing has changed on the claim from the claimant's perspective. They have consistently submitted the same claim since 2005. However, despite this fact, three payment adjustments were made for the 2008 claim year.

These stem from a Commons investigation which led to the aforementioned entitlement value adjustments. There are no notes in the case file to say why the investigation was triggered or why

Commons workers felt the adjustment was required. The greatest value of the three adjustments was a payment of £21.51 (not including a modulation rebate) which left the account £14.31 in credit.

Case 5 (Appeal Case)

In this case the claimant submitted a claim with no activated area. The claimant owned entitlements. While adjustments can be made to the claim before 31 May, no notice was given to the claimant before that date. A letter notifying the claimant of the discrepancy was sent on 16 July. At this point, the only avenue left to the claimant was the appeal.

The claimant filed an appeal claiming extenuating circumstances. However, the appeal was upheld because the claimant did not respond to make amendments within the legal timeframe stipulated under the rules of the scheme.

The claim value, had it been paid was between £200 - £230.

Case 6 (Tail Case)

This appears to be a high-value claim of approximately £90,000. The claim is also involved in a large entitlement trading network. It is this network which seems to be the cause of the delay, in that the trades could not be sorted out before the payment window closed.

More specifically, the confusion seems to stem, not from this claim, but from the trading partner. The numbers of entitlements traded to this claim are not inordinately large, but the trading partner is deeply entangled in a much larger web of trading. This web appears to have taken too long to sort out, and the payment window closed before an accurate position could be set.

Case 7 (High Versions – Low Interactions)

This claim contains routine land-based adjustment work. The reason for its inclusion in this category was because of an error in desktop instructions. The instruction directed processors to 'submit' the claim after minor changes, rather than 'save' the changes. The former puts the claim into the workflows of RITA, rather than just simply saving a changed value, which is the goal of the latter. Typically, processors were advised to make a series of changes (while 'saving' periodically) then 'submitting' the claim at the end of the series. The 'submit' function changes the version number, while the 'save' function does not. This is not the reason for the creation of work.

Work was created as a result of the claimant not fully understanding the rules concerning the drawing of field boundaries. Standard

Remote Sensing work picked up the discrepancy and put the claim in order.

Of note: this claim was also affected by the same 'Column 8 – Column 12' characteristic discussed in Case 3.

Case 8 (Low Versions – High Interactions)

The category of 'Low Versions – High Interactions' is misleading when attempting to understand any error associated with this case. While there were many interactions (some might say inordinately high interactions) all the processing work done on this case appears to be standard.

Remote sensing on the 2008 claim generated a series of land changes which affected the related entitlements. As a result, entitlement correction was performed cascading changes back to 2005. It was determined that poor mapping (both by the claimant and the agency) triggered the need for changes discovered by remote sensing, which, in turn, led to entitlement correction.

Case 9 (Late Payment – Multiple Payment)

For the 2008 claim year, the claimant submitted a letter along with the SP5 form which emphasised changes made to both claimed areas and entitlements. This letter led to investigations, which uncovered errors stemming from 2005 mapping.

In 2005, the claimant submits standard issue maps to the RPA, with the appropriate delineations of land parcels among the fields. An error is made by processors in translating that map into the RLR, where some boundaries and parcels are created/entered with mistakes. Total land area is entered incorrectly (in comparison to the claimant's maps) but the error goes ignored by the RPA because it appears the claimant is claiming less than is allowed.

An error is raised by RLR to say that the total land size on the claim does not match the total land size held in RLR. This error is not rectified.

For claim years 2006-7, the same land-size-discrepancy error is raised, and is not rectified. The claimant attempts to manually change the land-size on the claim form, but this change does not impact the resulting payment.

In 2008, the aforementioned letter submitted with the SP5 form raises the issue and an investigation discovers the error in the land parcel. The adjustment is made to ensure accuracy for the 2008 claim, and entitlement correction is performed to cascade changes back to 2005.

In this case, the claimant made multiple attempts to correct data provided to him (via the pre-population of the SP5 form), but changes were not implemented until 2008.

The payment element which happened after the claimant window was not an element associated with the 2008 claim, but was instead a summary payment of the value of the increased entitlements after the adjustment.

Case 10 (Multiple Payments Before the Close of the Payment Window)

Note: The descriptive state of this claim changed during the exercise. It was later determined that a recovery was discovered after the close of the payment window, due to entitlement correction work. It should also be noted that the recovery value was £0.76.

The original error causing the multiple payment was a result of an error made in completing the SP5 form by the claimant. The claimant entered an out-of-date field code. Encountering this, RITA (in effect) ignored fields with this code, and as a result, the parcel(s) is not included in the original payment. The error was spotted and a second payment was made before the close of the payment window.

It should be noted that the same error was made by a significant number of claimants, all of which received similar treatment. It was determined by the SMU that the original ability for RITA to catch/prevent this error, now no longer functioned. Each case had to be identified and managed outside the normal workflow.

In relation to the recovery of £0.76 mentioned in the note above; this was a result of incomplete entitlement valuation after a correction exercise. The completed process generated a per-entitlement adjustment of £0.008, which totalled £0.76 for the entire claim. This is below the de minimis and will not be recouped.

Case 11 (CSP Case)

The evidence suggests that this case is in this category because it is a high-value claim (£187,000). As such, there is no error to investigate to understand its placement in a selection category. However, an examination of the claim revealed an error in land size and entitlement based in the 2005 claim year. Again, the error discovered is unrelated to the category used for examination.

In 2005, the claimant submitted maps to the agency which were accepted and used for the initial RLR. Later that year, an inspection revealed ineligible features and a discrepancy in parcel sizes. However, the claim was paid incorrectly on the values submitted prior to the inspection. It should also be noted that the 2005 claim had a partial payment of 80% estimated value in May 2006, and correspondence revealed that the remainder payment had not been made as of September 2006. In November 2006, field size reductions and potential penalties were discussed with the claimant. This discussion does not produce a final verdict for many more months.

Subsequently, the 2006 claim also contained the incorrect values, and was processed and paid without the adjustments.

The adjustments were not correctly applied until the 2007 claim year. The payment this year contained the required adjustments. A penalty was raised in 2007 against the 2005-6 claims, which created an overpayment status for these years.

The claimant agrees to have the amount intercepted from the 2008 claim year payment.

Case 12 (Late Payment – Multiple Payments)

The late payment in this case was for £6.89 on a claim valued at £7,641.99. The payment is a result of adjustments to entitlement values on a Common, as well as from land missing from the 2005 claim due to data entry errors.

The land was also missing from the 2006 claim, despite the claimant's attempts to have it restored.

A secondary error occurred in processing the 2006 claim, when the historic entitlement value dropped off the payment value. This went unnoticed at the time by both the processor and the claimant.

Further adjustments were necessary as a result of a re-evaluation of a Common (for unknown reasons), whereupon the livestock units allotted to the claimant was adjusted upwards. At the same time, the overall land claimed for the SBI dropped significantly (from 59ha to 33ha).

This case exploration suffered significantly due to the lack of an audit trail. It could not be determined why many changes were made.

Case 13 (Tail Case)

This case was left unpaid after the close of the payment window due to the death of the original claimant during the claim year. The SBI was in normal probate processing until such a point as the rightful recipient of the payment could be legally identified. This is also a low value case (under £400).

Case 14 (Appeal Case)

This appeal was filed because the claimant did not receive a payment on their 2008 claim. Portions of the claim were deemed invalid because the entitlements presented with the form did not belong to the claimant.

The year prior (2007), the claimant filed an RLE1 form for the acquisition of a set of entitlements through a lease agreement with an expiration date. The agreement subsequently expired prior to the submission of the 2008 claim form.

The required RLE1 form extending the agreement after the original agreement expired was never submitted. As such, the entitlements reverted back to their original owner. The claimant (and the original owner of the entitlements) filed appeals against the decision, but both were rejected.

Note: After the appeal was rejected, another RLE1 form was submitted to renew the entitlement lease. However, on this occasion, the form was submitted without an end date, which is not allowed under scheme rules. This was not caught by either processor or system, which means the entitlements are now being leased in perpetuity.

Case 15 (Late Payment – Multiple Payments)

This claim was submitted to the agency via one of the drop-in centres on Saturday, 17 May. The deadline for submission was Thursday, 15 May; two calendar days, but one working day after the deadline. This claim should have incurred a 1% penalty.

The claim was processed normally and paid, but with a 2% penalty which had been incorrectly applied by RITA. System rules had not been updated to differentiate between weekend/holiday and work days. The error was caught on approximately 1,700 claims and adjustments were made, resulting in a top-up payment to the claimant after the close of the payment window.

Case 16 (Multiple Payments Before the Close of the Payment Window)

The addition of claimed livestock units to a Commons claim prompted the re-evaluation of the entitlement values (back to 2005). With the newly-accurate data, Commons redefinition resulted in a top-up payment for the claimant, which comprised of adjustments for all years back to 2005 inclusive.

During investigation, an SP5 pre-population error was discovered on the 2006 claim form. The claimant manually changed this figure and submitted the claim. Upon inspection of the claim records, it could not be determined how the incorrect figure ended up on the pre-populated form, as all the data contained on the record was accurate.

Case 17 (Multiple Payments Before the Close of the Payment Window)

This case shares a common history with Case 10, whereby invalid field codes were submitted by the claimant with the SP5 form. The codes triggered RITA to incorrectly 'zero-out' the field with the invalid codes. This action was not caught before payment. After the payment was made, the error was spotted and corrected. The claimant received a top-up payment before the close of the payment window.

Case 18 (Late Payment)

The root problem on this case could not be clearly defined. For an indeterminate reason, the claim failed to be included in the 2008 AVR run. It remained in RITA but outside the normal workflows until July 2009.

In discussing the case with members of OPT staff, it seems there were a number of cases that were similarly stuck requiring special effort to progress them forward to the next stage of processing.

<u>Case 19 (Late Payment)</u>

This claim was involved in a significantly large entitlement trading network. The entitlements traded in this network were also involved in multiple entitlement correction exercises, resulting in both overpayment and underpayment investigations. This work consumed the available time of the payment window, prompting an estimated partial payment, which was made one day after the deadline.

As there is no IT system functionality for the scope and scale of the work required to clarify the large trading networks and the related entitlement value adjustments, manual calculations were required.

Further, Remote Sensing performed in 2007 confirmed required adjustments dating back to 2005 for the land and entitlements originally linked to this claim. There is additional evidence showing that the results of the Remote Sensing inspection in 2007 confirmed what the agency knew in 2005, but were unable to adjust properly in the IT system.

<u>Case 20 (Low Versions – High Interactions)</u>

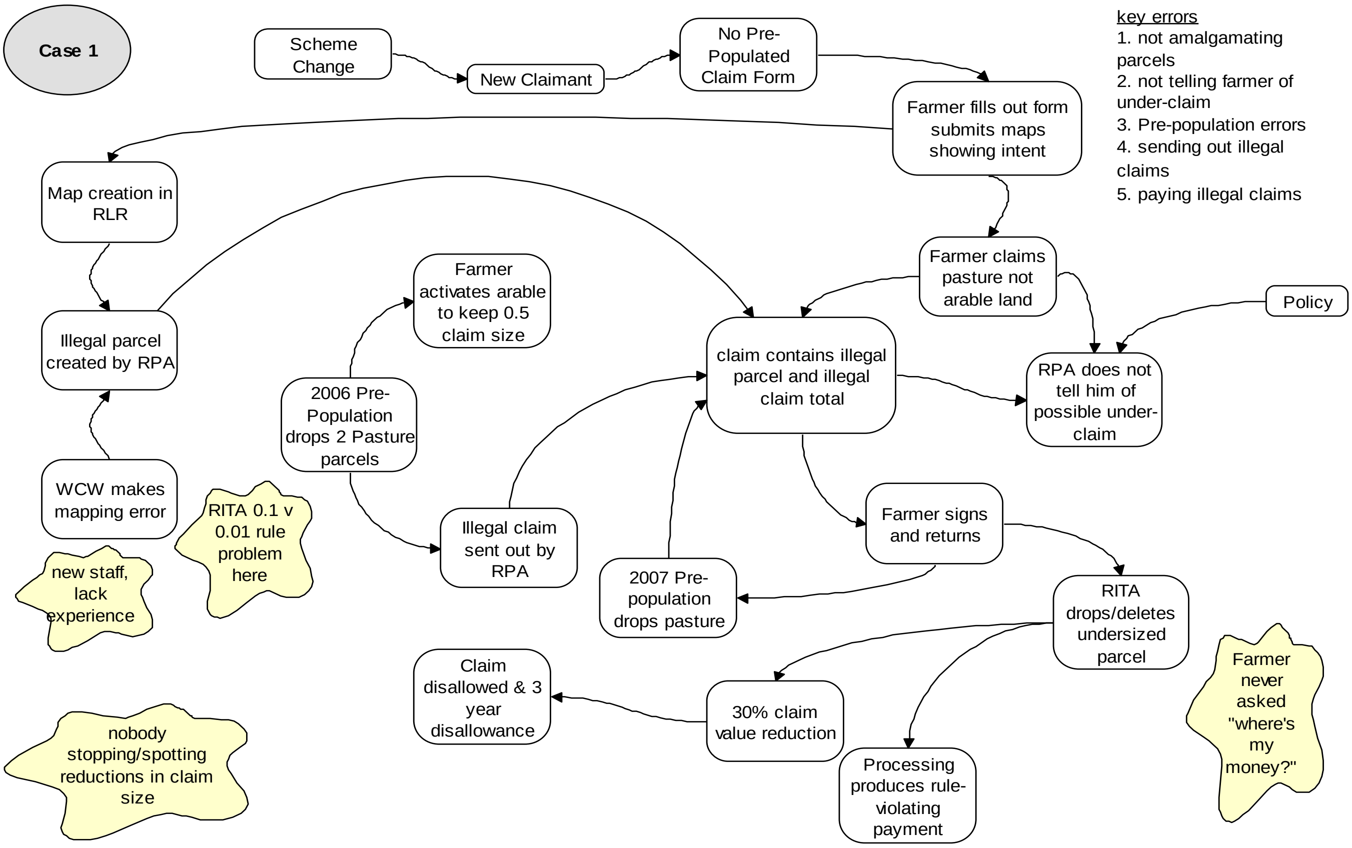
As mentioned previously in Case 8, the category of 'Low Versions – High Interactions' is misleading when attempting to understand any error associated with this case as well. While there were many interactions (some might say inordinately high interactions) all the processing work done on this case appears to be standard.

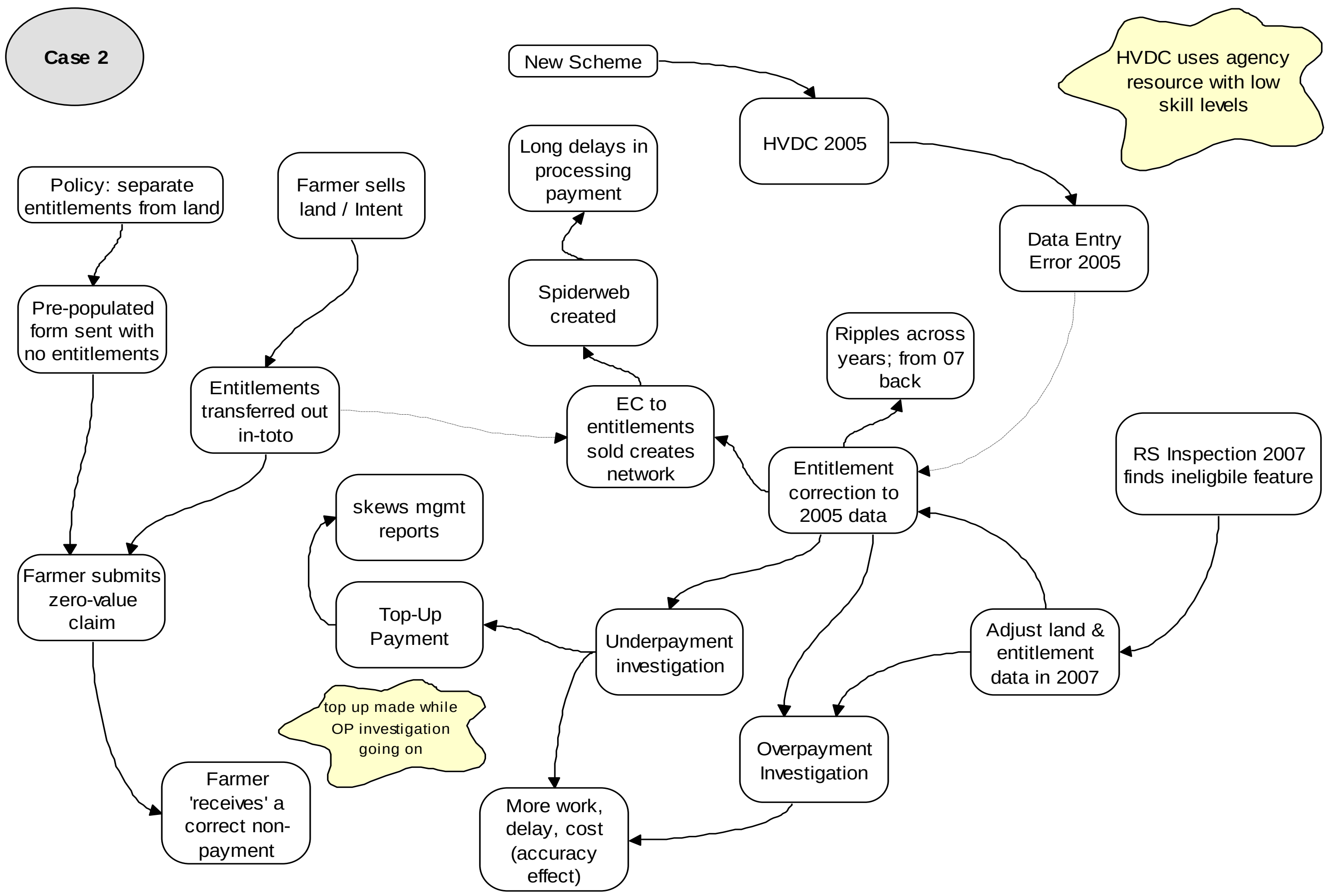
However, the error associated with this case can be attributed to both the claimant and in scanning the claim form for the purpose of data uptake into RITA.

The claimant changed details on 13 parcels of land, inadvertently creating duplicate parcels. This addition created a standard task (Overclaim Recheck) which was rectified by standard claim processing.

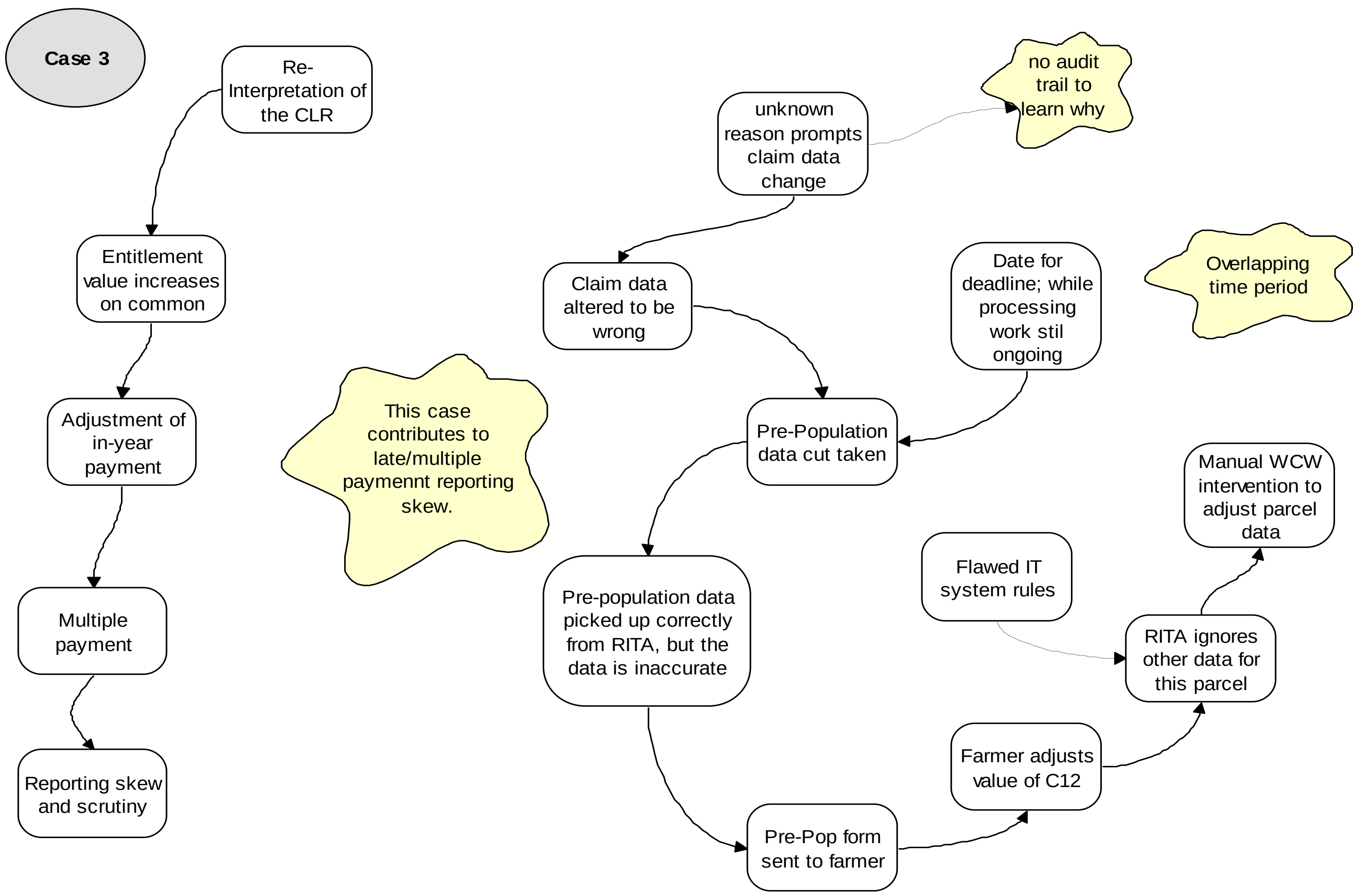
Further work was created by errors in claim scanning, where only a portion of the required data was collected for a page-worth of parcels. Only half the image was available, and as such only half the parcel data was available. The resulting work was completed in standard claim processing.

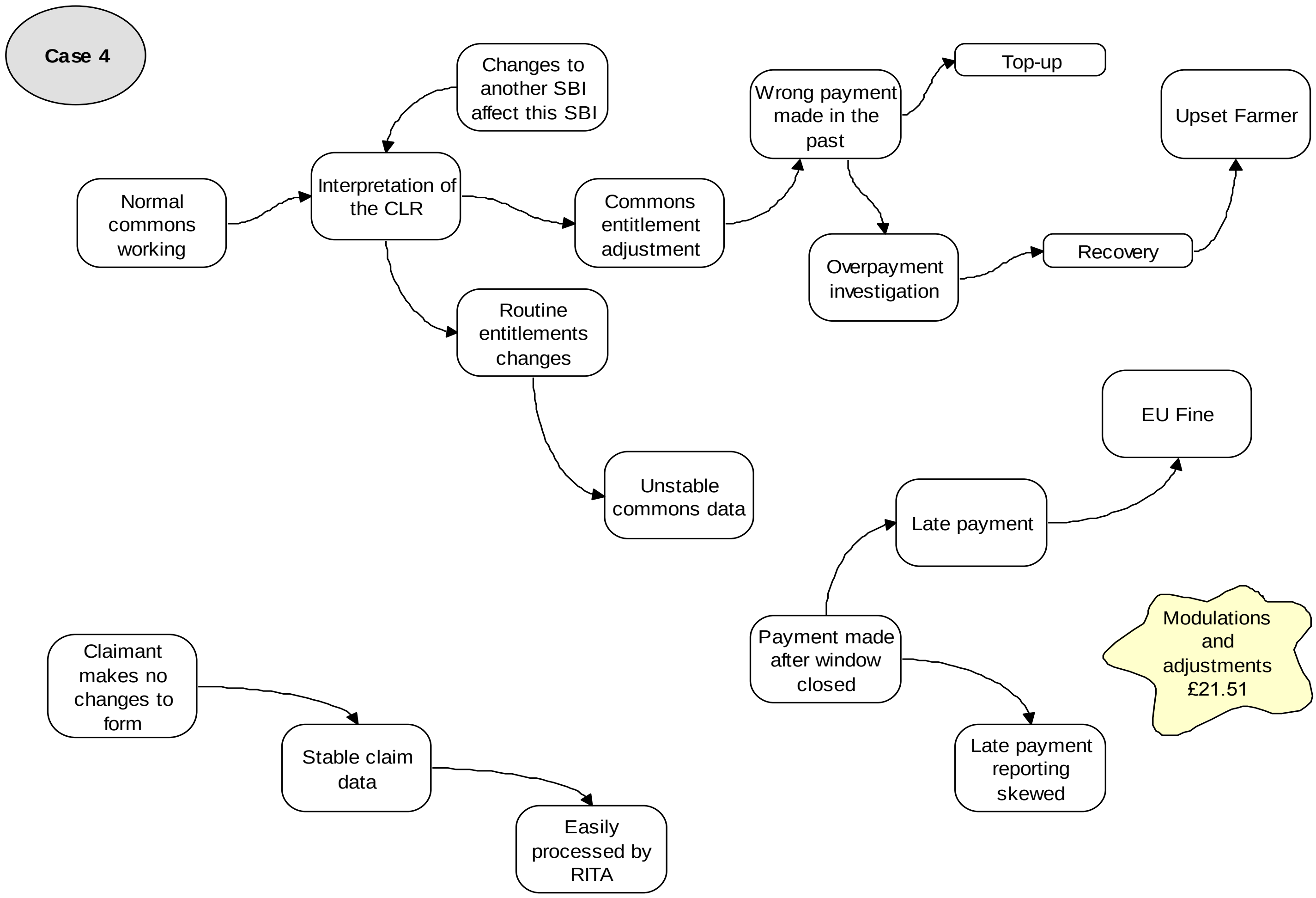
APPENDIX 8C: CASE MAPS

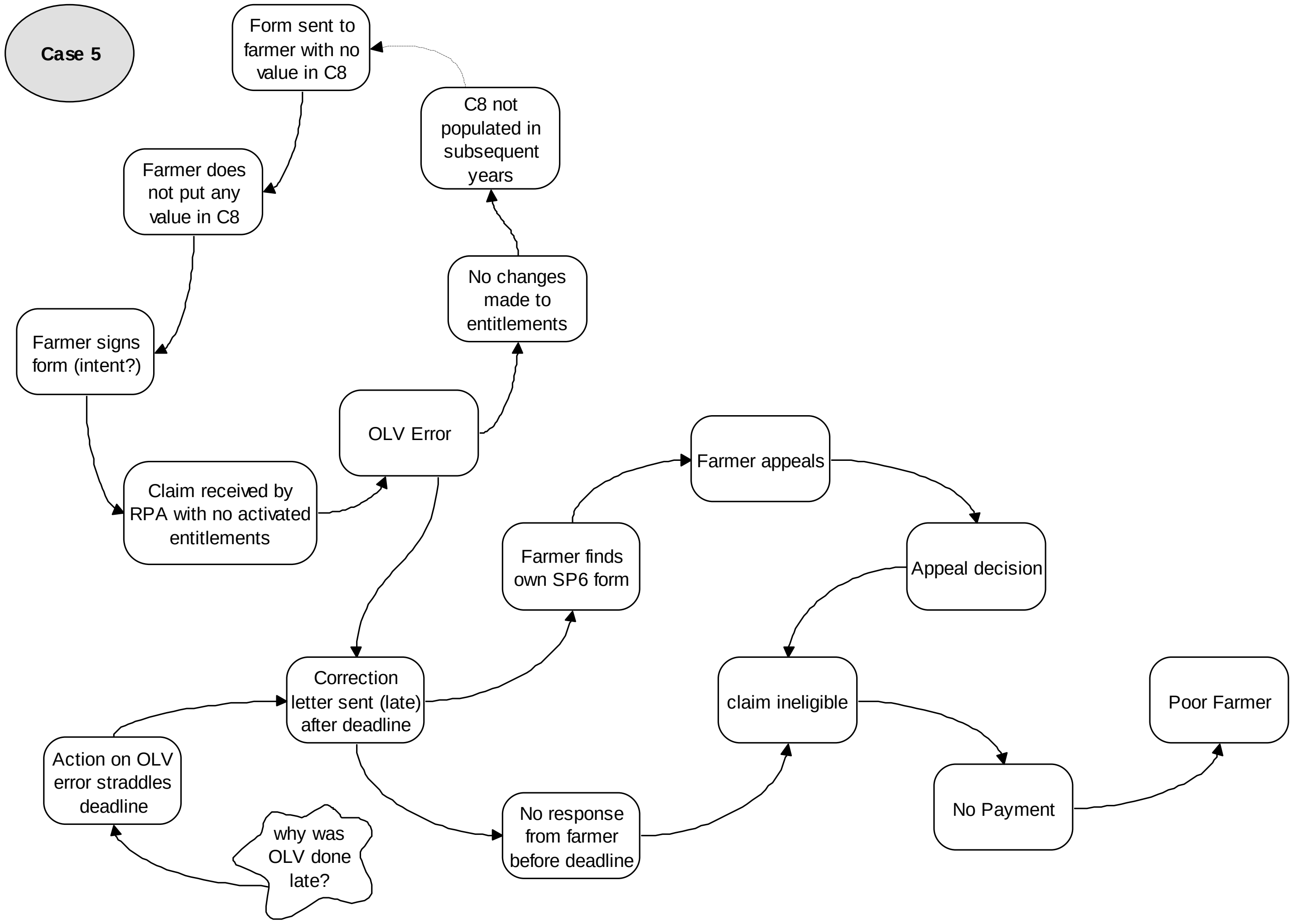




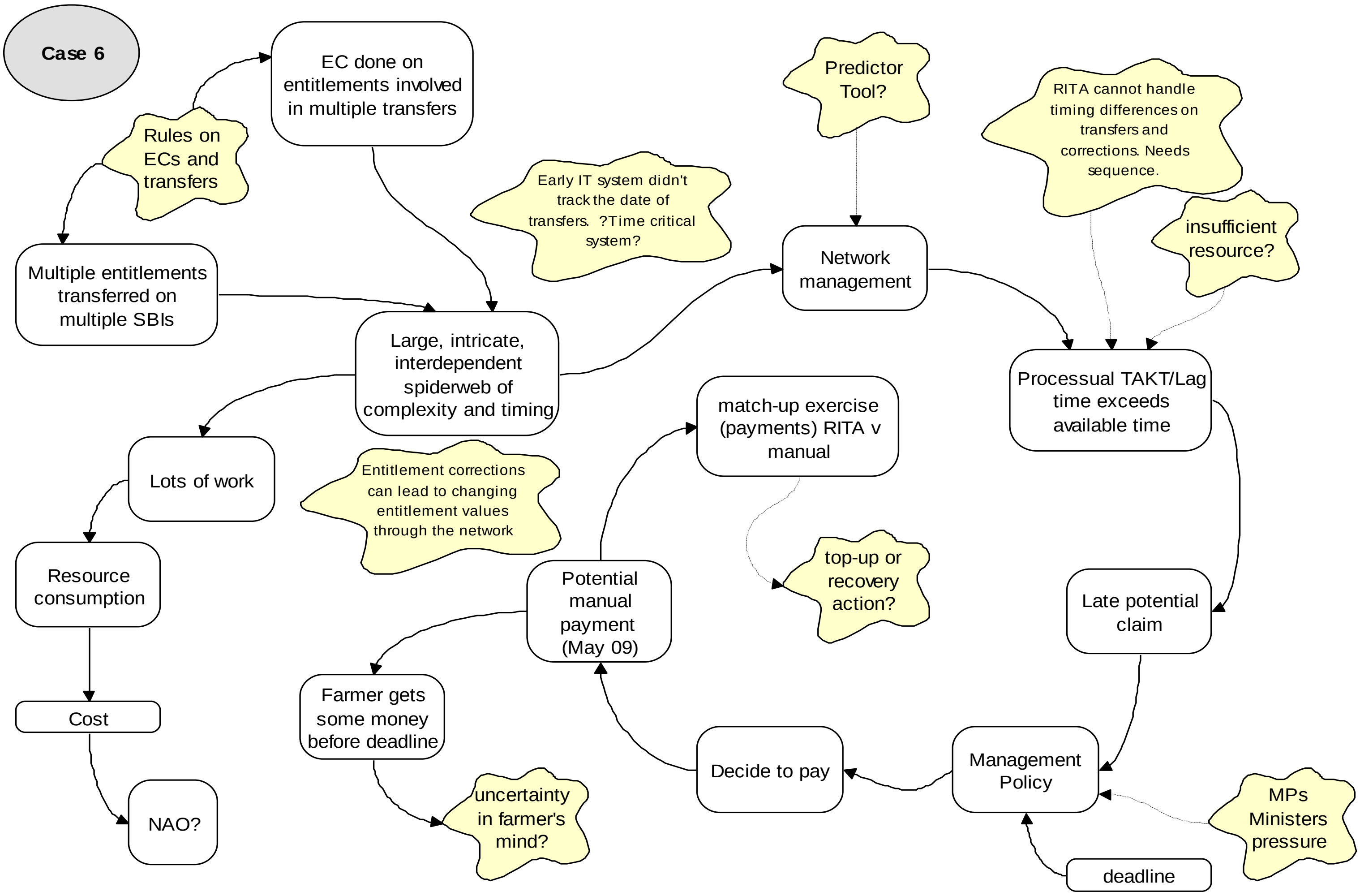
Case 2
New Scheme
HVDC uses agency resource with low skill levels
HVDC 2005
Long delays in processing payment
Policy: separate entitlements from land
Farmer sells land / Intent
Data Entry Error 2005
Spiderweb created
Pre-populated form sent with no entitlements
Ripples across years; from 07 back
Entitlements transferred out in-toto
EC to entitlements sold creates network
RS Inspection 2007 finds ineligbile feature
Entitlement correction to 2005 data
skews mgmt reports
Farmer submits zero-value claim
Top-Up Payment
Underpayment investigation
Adjust land & entitlement data in 2007
top up made while OP investigation going on
Overpayment Investigation
Farmer 'receives' a correct non-payment
More work, delay, cost (accuracy effect)


Case 3
Re-Interpretation of the CLR
Entitlement value increases on common
Adjustment of in-year payment
Multiple payment
Reporting skew and scrutiny
This case contributes to late/multiple paymennt reporting skew.
unknown reason prompts claim data change
no audit trail to learn why
Claim data altered to be wrong
Date for deadline; while processing work stil ongoing
Overlapping time period
Pre-Population data cut taken
Pre-population data picked up correctly from RITA, but the data is inaccurate
Manual WCW intervention to adjust parcel data
Flawed IT system rules
RITA ignores other data for this parcel
Farmer adjusts value of C12
Pre-Pop form sent to farmer

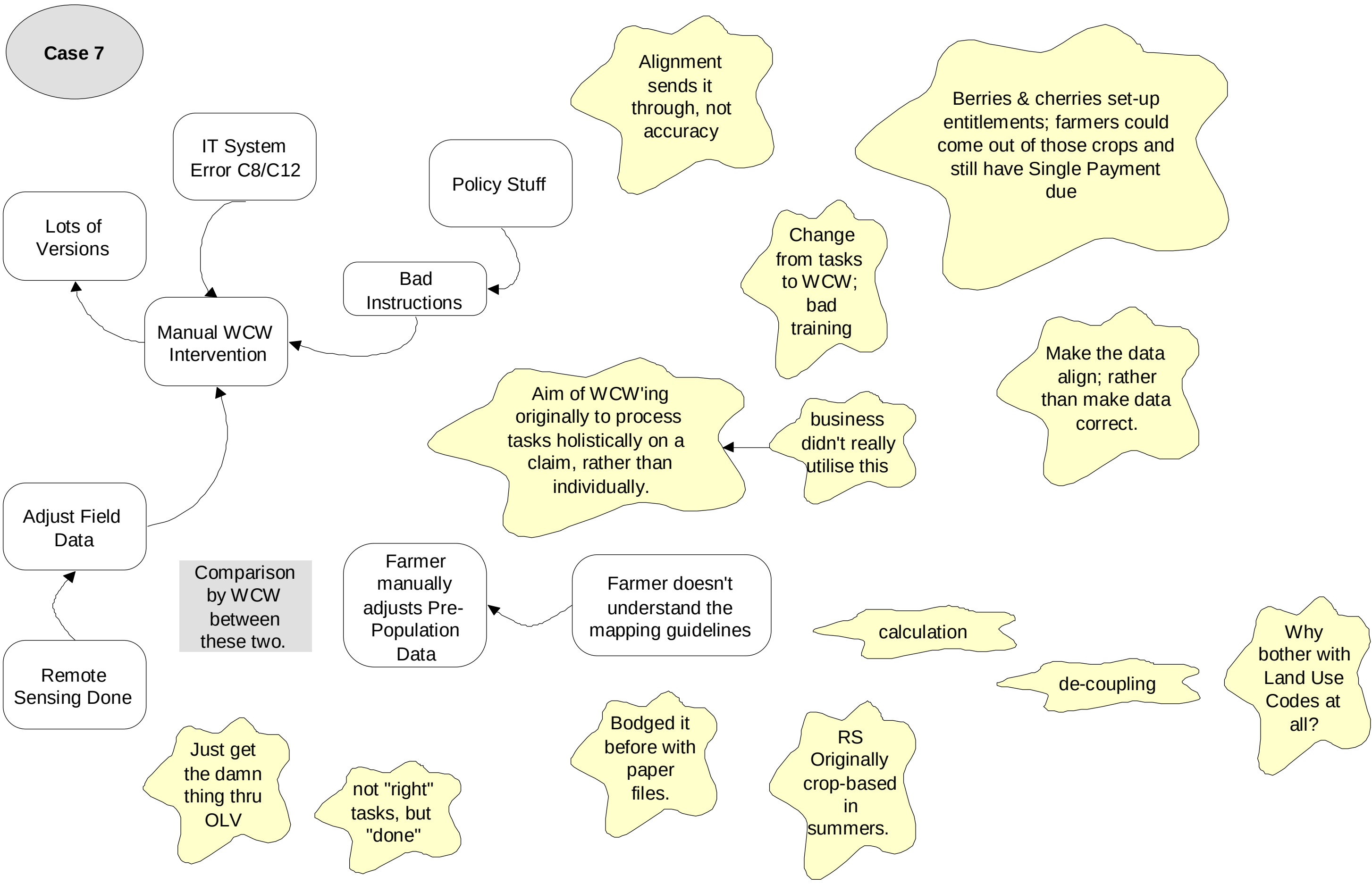

Case 4
Changes to another SBI affect this SBI
Normal commons working
Interpretation of the CLR
Commons entitlement adjustment
Wrong payment made in the past
Top-up
Upset Farmer
Overpayment investigation
Recovery
Routine entitlements changes
Unstable commons data
EU Fine
Late payment
Payment made after window closed
Modulations and adjustments £21.51
Late payment reporting skewed
Claimant makes no changes to form
Stable claim data
Easily processed by RITA

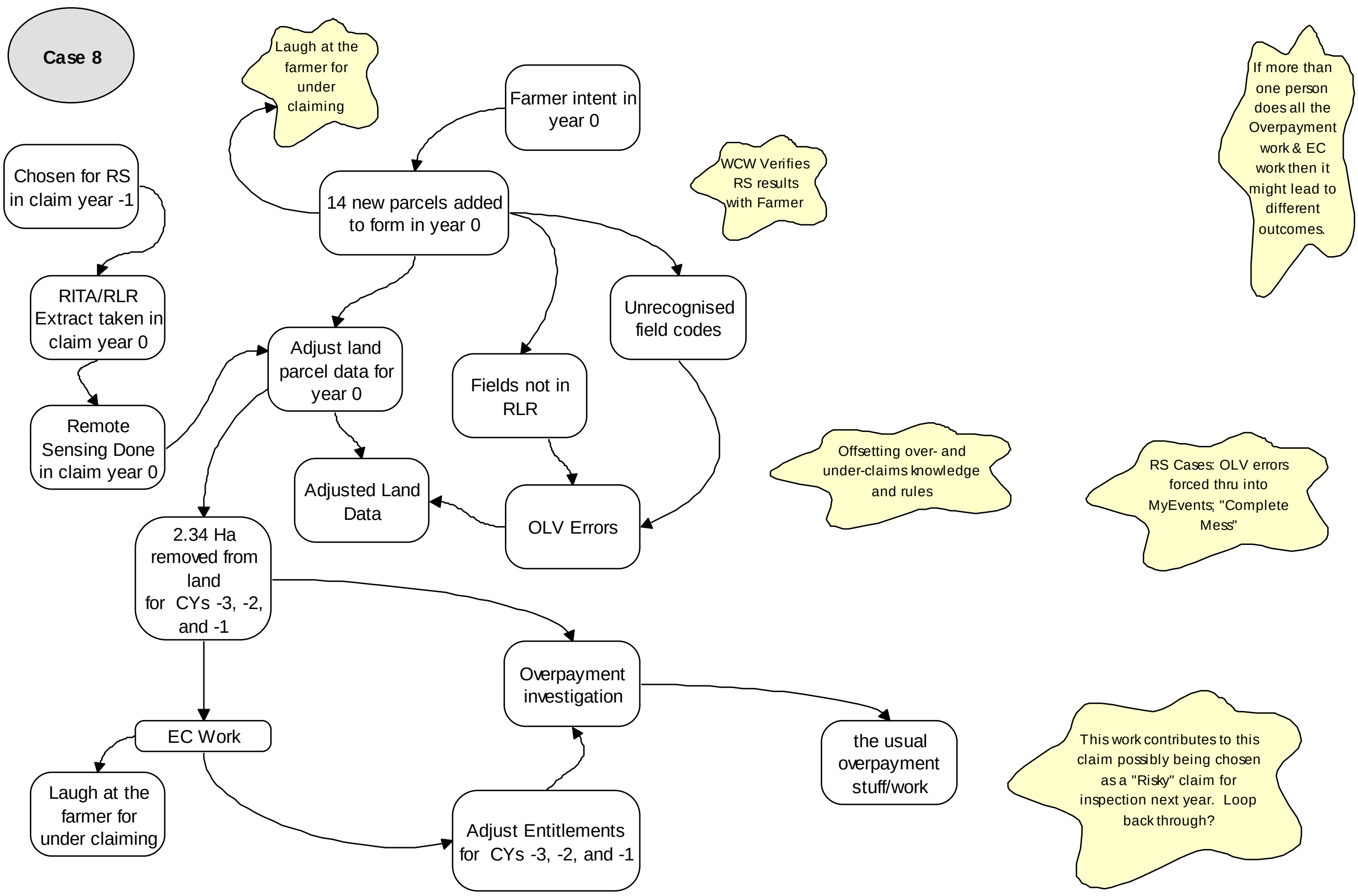


Case 5
Form sent to farmer with no value in C8
C8 not populated in subsequent years
Farmer does not put any value in C8
No changes made to entitlements
Farmer signs form (intent?)
OLV Error
Farmer appeals
Claim received by RPA with no activated entitlements
Farmer finds own SP6 form
Appeal decision
Correction letter sent (late) after deadline
claim ineligible
Poor Farmer
Action on OLV error straddles deadline
No response from farmer before deadline
No Payment
why was OLV done late?

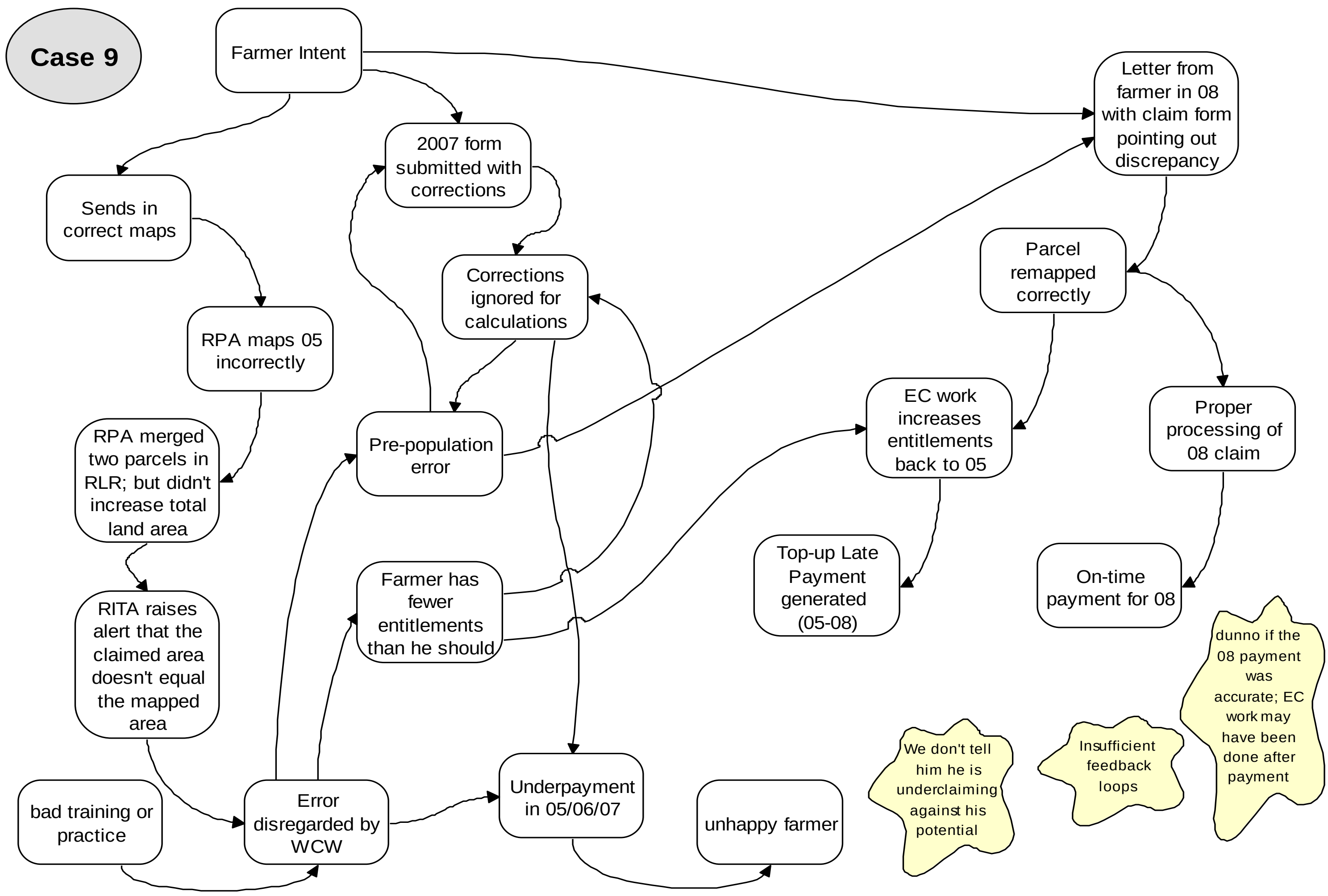


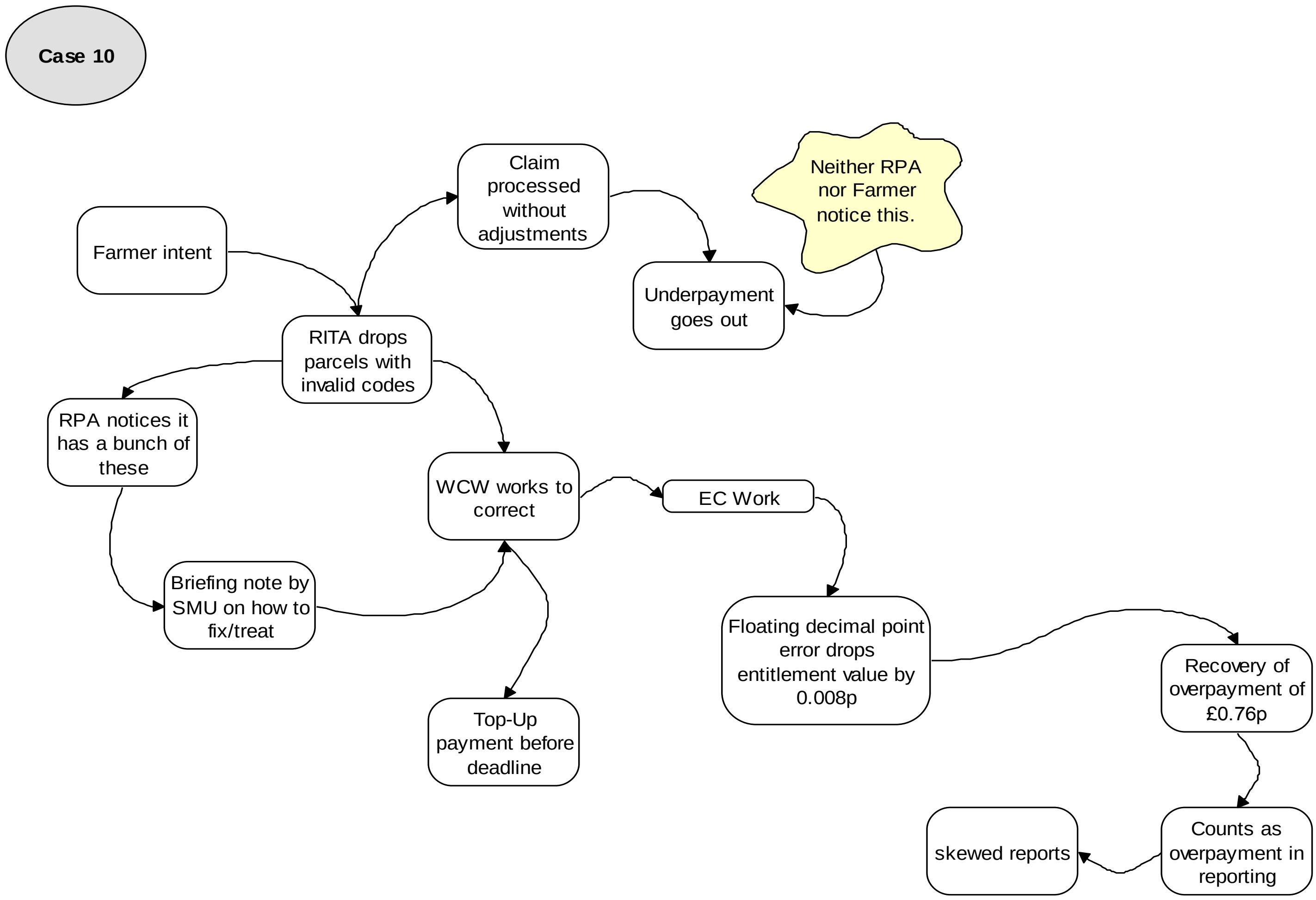
Case 6
EC done on entitlements involved in multiple transfers
Rules on ECs and transfers
Multiple entitlements transferred on multiple SBIs
Early IT system didn't track the date of transfers. ?Time critical system?
Large, intricate, interdependent spiderweb of complexity and timing
Predictor Tool?
Network management
RITA cannot handle timing differences on transfers and corrections. Needs sequence.
insufficient resource?
Processual TAKT/Lag time exceeds available time
Lots of work
Entitlement corrections can lead to changing entitlement values through the network
match-up exercise (payments) RITA v manual
top-up or recovery action?
Resource consumption
Potential manual payment (May 09)
Late potential claim
Cost
Farmer gets some money before deadline
Decide to pay
Management Policy
NAO?
uncertainty in farmer's mind?
MPs Ministers pressure
deadline


Case 7
IT System Error C8/C12
Policy Stuff
Alignment sends it through, not accuracy
Berries & cherries set-up entitlements; farmers could come out of those crops and still have Single Payment due
Lots of Versions
Bad Instructions
Manual WCW Intervention
Change from tasks to WCW; bad training
Make the data align; rather than make data correct.
Aim of WCW'ing originally to process tasks holistically on a claim, rather than individually.
business didn't really utilise this
Adjust Field Data
Comparison by WCW between these two.
Farmer manually adjusts Pre-Population Data
Farmer doesn't understand the mapping guidelines
calculation
de-coupling
Why bother with Land Use Codes at all?
Remote Sensing Done
Just get the damn thing thru OLV
not "right" tasks, but "done"
Bodged it before with paper files.
RS Originally crop-based in summers.

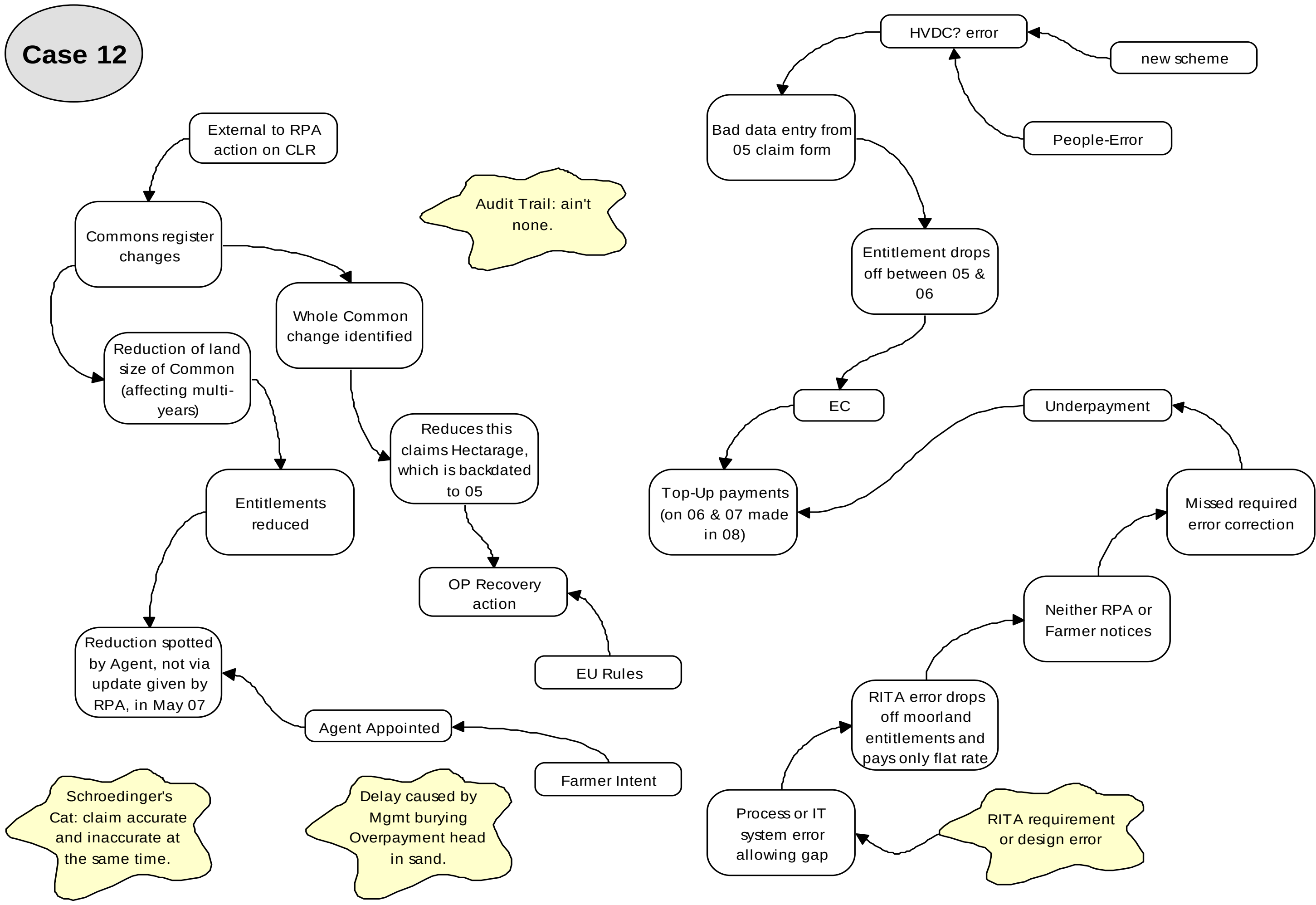


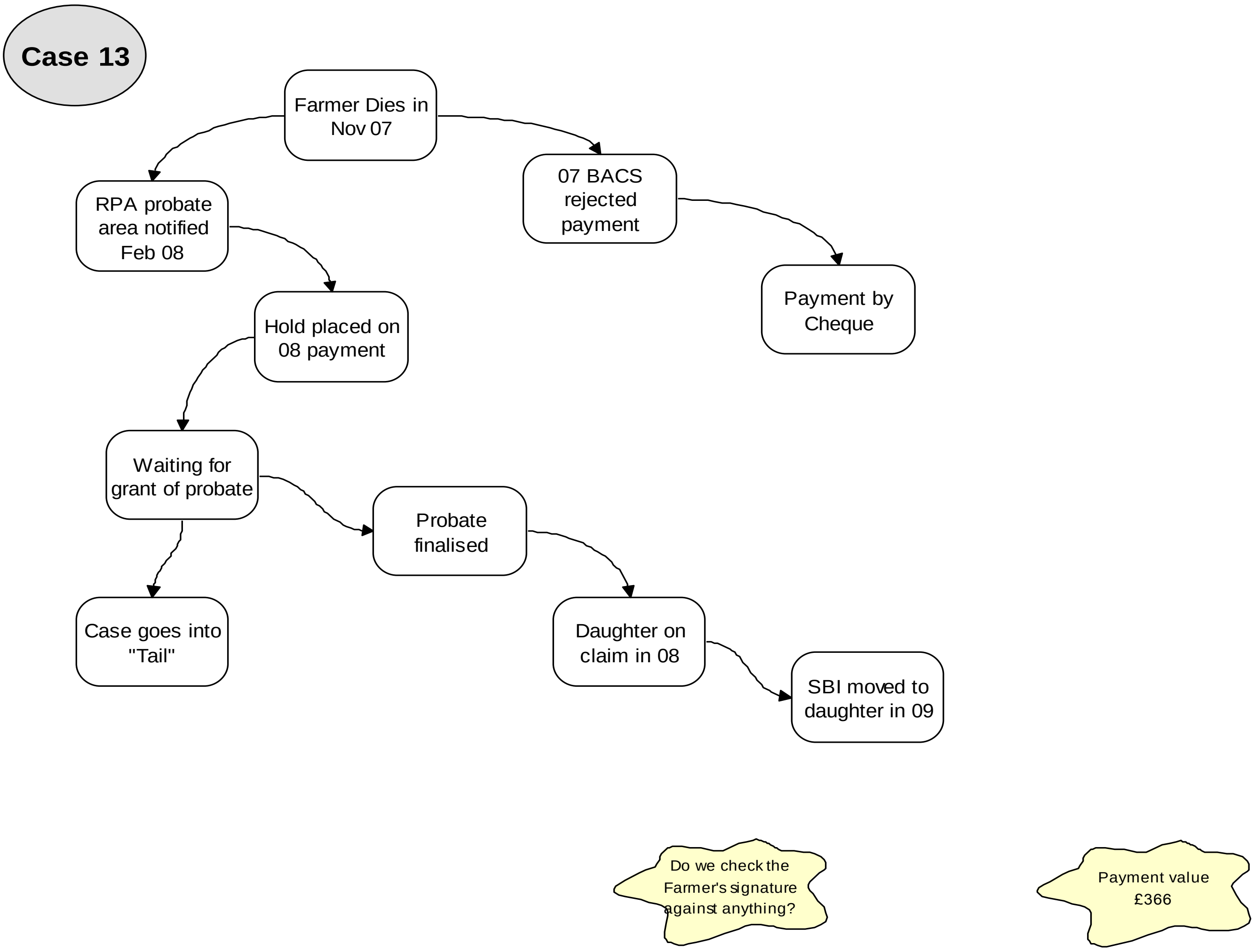
Case 8
Laugh at the farmer for under claiming
Farmer intent in year 0
If more than one person does all the Overpayment work & EC work then it might lead to different outcomes.
Chosen for RS in claim year -1
14 new parcels added to form in year 0
WCW Verifies RS results with Farmer
RITA/RLR Extract taken in claim year 0
Unrecognised field codes
Adjust land parcel data for year 0
Fields not in RLR
Remote Sensing Done in claim year 0
Offsetting over- and under-claims knowledge and rules
RS Cases: OLV errors forced thru into MyEvents; "Complete Mess"
Adjusted Land Data
OLV Errors
2.34 Ha removed from land for CYs -3, -2, and -1
Overpayment investigation
EC Work
the usual overpayment stuff/work
This work contributes to this claim possibly being chosen as a "Risky" claim for inspection next year. Loop back through?
Laugh at the farmer for under claiming
Adjust Entitlements for CYs -3, -2, and -1

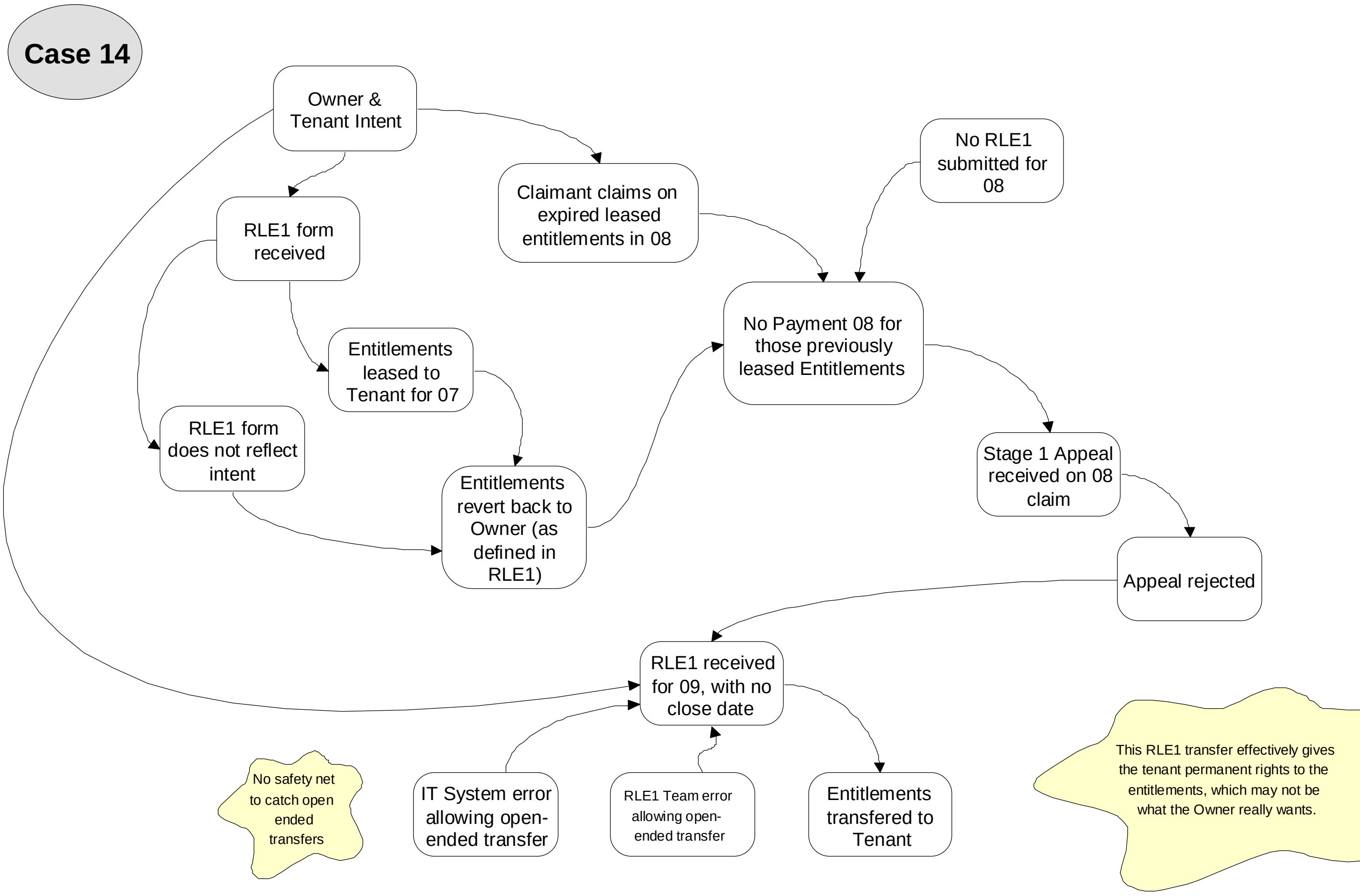

Case 9
Farmer Intent
Sends in correct maps
2007 form submitted with corrections
Letter from farmer in 08 with claim form pointing out discrepancy
Corrections ignored for calculations
RPA maps 05 incorrectly
Parcel remapped correctly
RPA merged two parcels in RLR; but didn't increase total land area
Pre-population error
EC work increases entitlements back to 05
Proper processing of 08 claim
RITA raises alert that the claimed area doesn't equal the mapped area
Farmer has fewer entitlements than he should
Top-up Late Payment generated (05-08)
On-time payment for 08
dunno if the 08 payment was accurate; EC work may have been done after payment
We don't tell him he is underclaiming against his potential
Insufficient feedback loops
bad training or practice
Error disregarded by WCW
Underpayment in 05/06/07
unhappy farmer

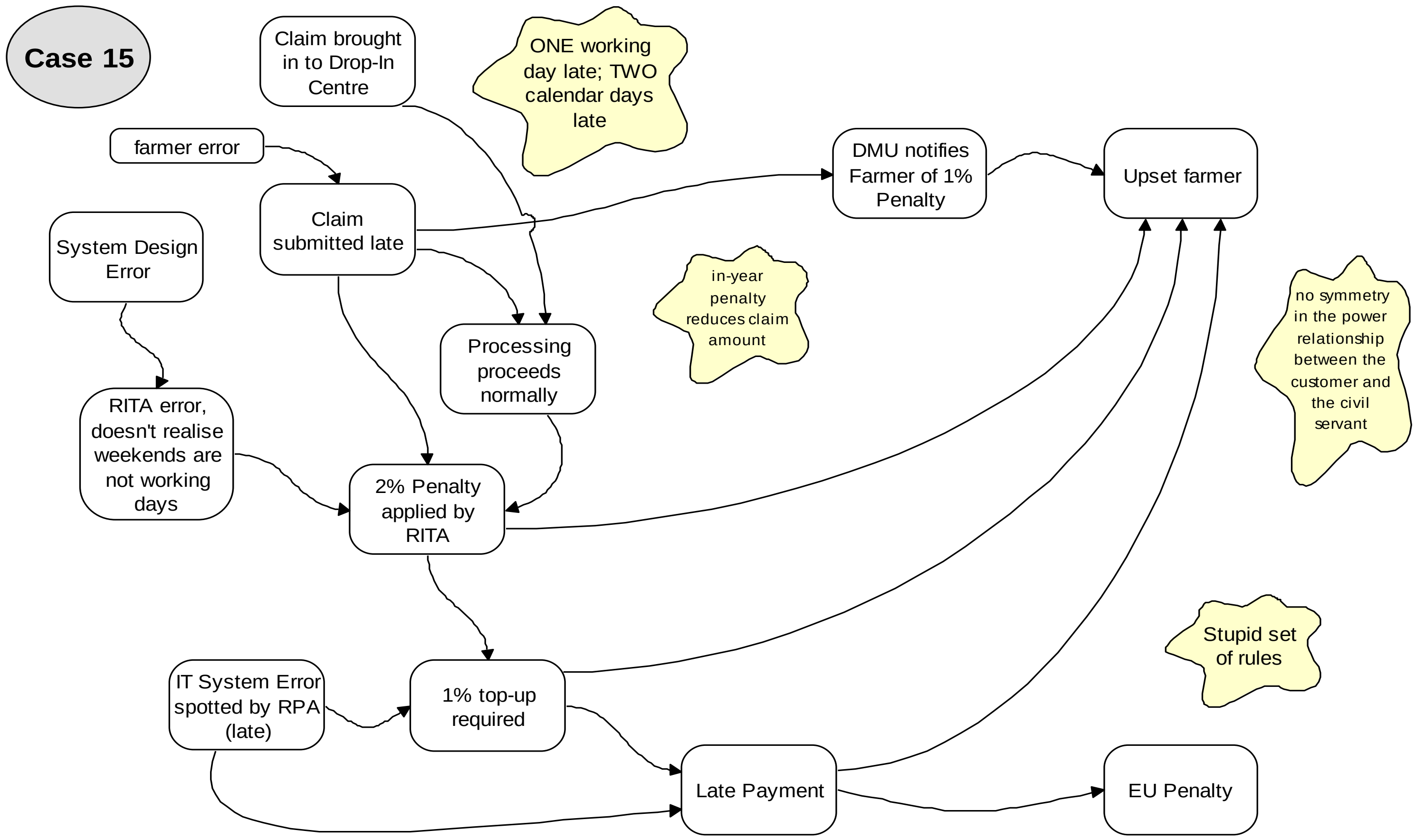

Case 10
Claim processed without adjustments
Neither RPA nor Farmer notice this.
Farmer intent
Underpayment goes out
RITA drops parcels with invalid codes
RPA notices it has a bunch of these
WCW works to correct
EC Work
Briefing note by SMU on how to fix/treat
Floating decimal point error drops entitlement value by 0.008p
Recovery of overpayment of £0.76p
Top-Up payment before deadline
skewed reports
Counts as overpayment in reporting

Case 11
Tactical management decisions (avoid due to tech, ignorance, etc.)
2005 Inspection performed
Delay in sorting land-based discrepancies in 05 claim
Why did nobody sort this one out? there was no architecture, knowledge, tools to mend the problem.
Adjustments to Land Data: ineligible areas & smaller fields
Farmer appoints agent
RLR may not have been updated with inspection results
RITA unable to process inspections
created extra work RPA can't process
Agent pressures RPA, which speeds things up
Land analysis via inspection leads to penalty
Penalties at RPA not able to be applied until 2006
Pressure to push payments out AFTER deadline
Delay in processing
Penalty raised Jan 2007 (at start of payment window 2006) on 05 claim
Farmer receives partial 2005 payment (May 2006)
Wrong Payment
Penalty can cause overpayment
Farmer appeals
Producer phones asking about "the rest"
True debt check done; appeal rejected
Late Payment
Case 11 cont.
RPA sends out land data
Farmer tries to correct data
Two claims for same SBI, consecutive years, processed ok thru RITA, but with uncorrected errors
Reactive mgmt; fear of EU penalties; reluctance to confront OPs
RPA does not apply farmer's or inspection corrections
Not dealing with OPs in winter 07-08. (run and hide; too busy getting other work done.)
05 claim remains wrong
2005 claim reprocessed to generate OP, Oct. 08
2005 instability rolls into 2006
Bad land data effeccts downstream payments, **penalties**, adjustments, etc.
06 Claim pre-popped wrong
Farmer signs and returns 06 claim form
2006 payment made on-time, but wrong
07 Claim pre-popped wrong
Penalty applied on 06 claim in Feb 08
2007 payment made Feb. 08

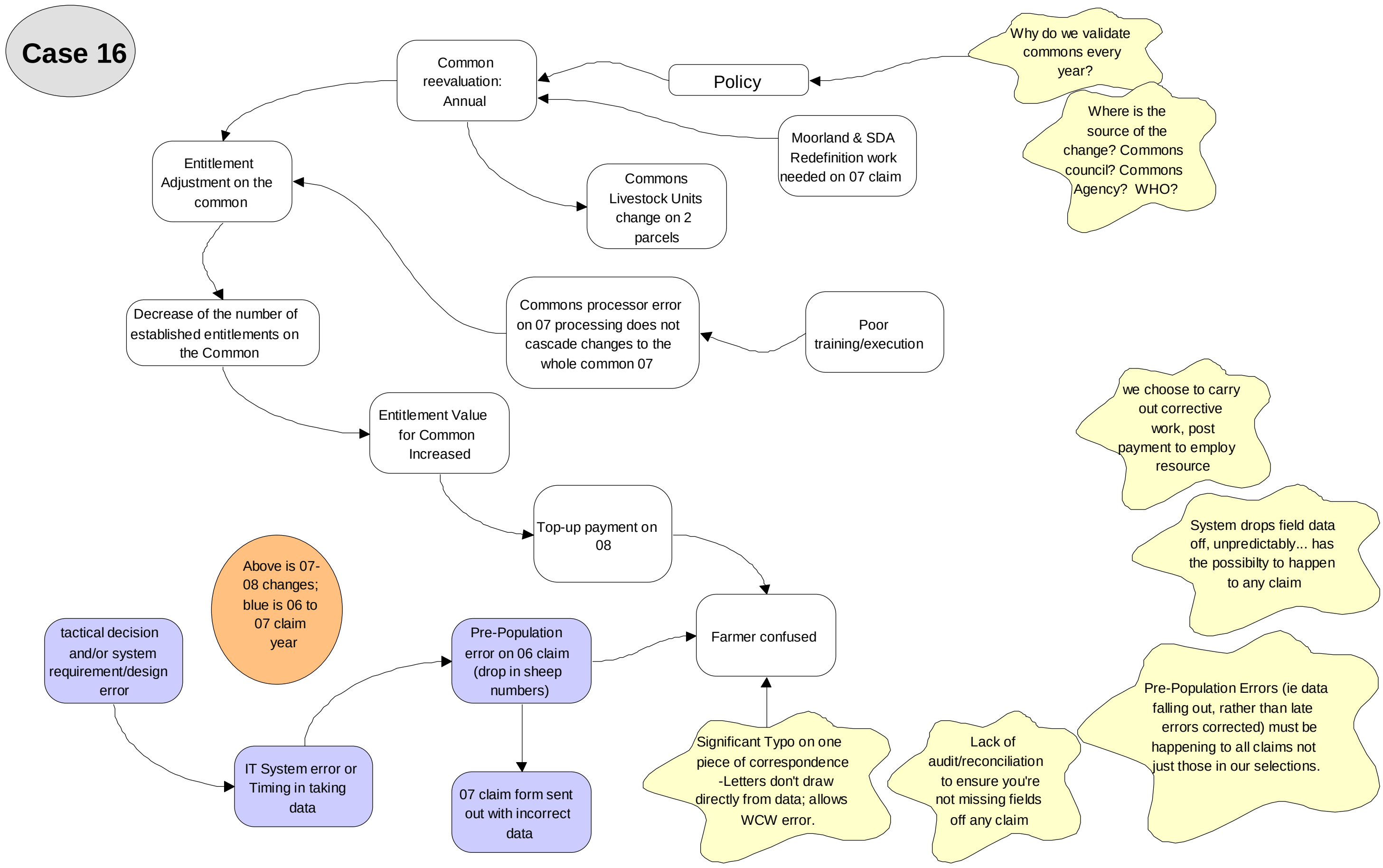

Case 12
External to RPA action on CLR
Commons register changes
Whole Common change identified
Reduction of land size of Common (affecting multi-years)
Entitlements reduced
Reduces this claims Hectarage, which is backdated to 05
OP Recovery action
EU Rules
Reduction spotted by Agent, not via update given by RPA, in May 07
Agent Appointed
Farmer Intent
Audit Trail: ain't none.
Schroedinger's Cat: claim accurate and inaccurate at the same time.
Delay caused by Mgmt burying Overpayment head in sand.
HVDC? error
new scheme
People-Error
Bad data entry from 05 claim form
Entitlement drops off between 05 & 06
EC
Top-Up payments (on 06 & 07 made in 08)
Underpayment
Missed required error correction
Neither RPA or Farmer notices
RITA error drops off moorland entitlements and pays only flat rate
Process or IT system error allowing gap
RITA requirement or design error

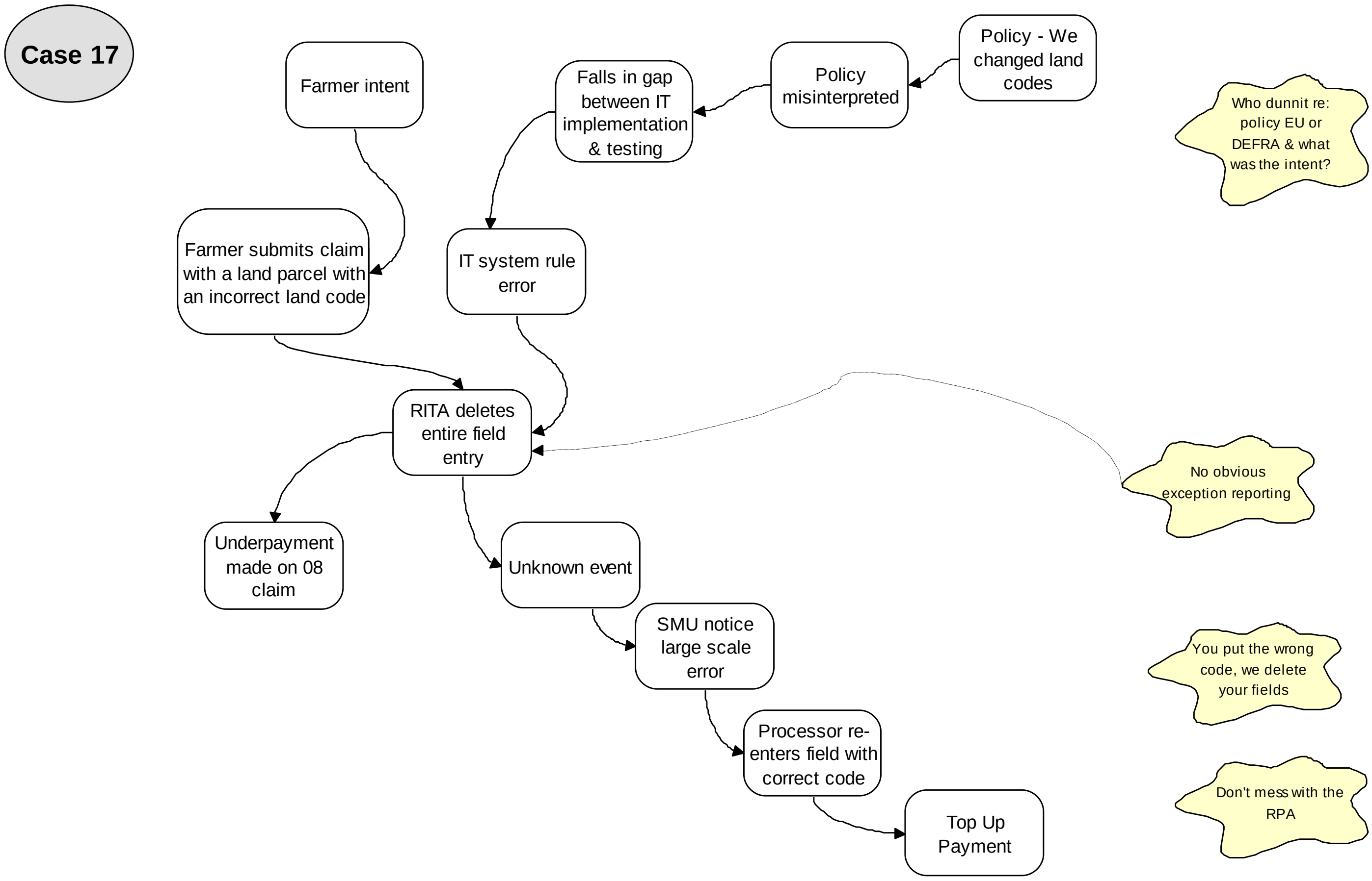

Case 13
Farmer Dies in Nov 07
RPA probate area notified Feb 08
07 BACS rejected payment
Payment by Cheque
Hold placed on 08 payment
Waiting for grant of probate
Probate finalised
Case goes into "Tail"
Daughter on claim in 08
SBI moved to daughter in 09
Do we check the Farmer's signature against anything?
Payment value £366

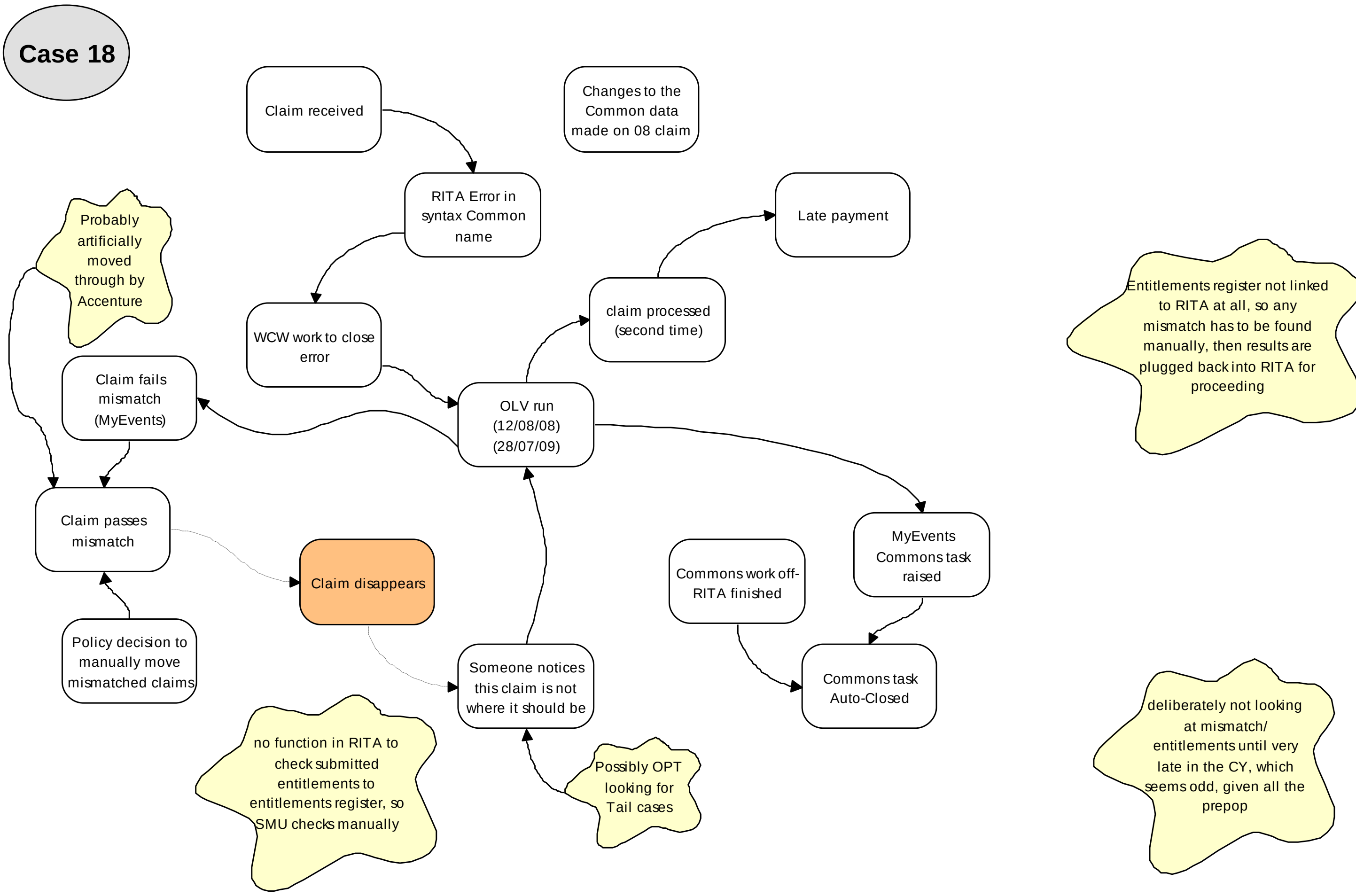

Case 14
Owner & Tenant Intent
RLE1 form received
Claimant claims on expired leased entitlements in 08
No RLE1 submitted for 08
Entitlements leased to Tenant for 07
No Payment 08 for those previously leased Entitlements
RLE1 form does not reflect intent
Entitlements revert back to Owner (as defined in RLE1)
Stage 1 Appeal received on 08 claim
Appeal rejected
RLE1 received for 09, with no close date
No safety net to catch open ended transfers
IT System error allowing open-ended transfer
RLE1 Team error allowing open-ended transfer
Entitlements transfered to Tenant
This RLE1 transfer effectively gives the tenant permanent rights to the entitlements, which may not be what the Owner really wants.

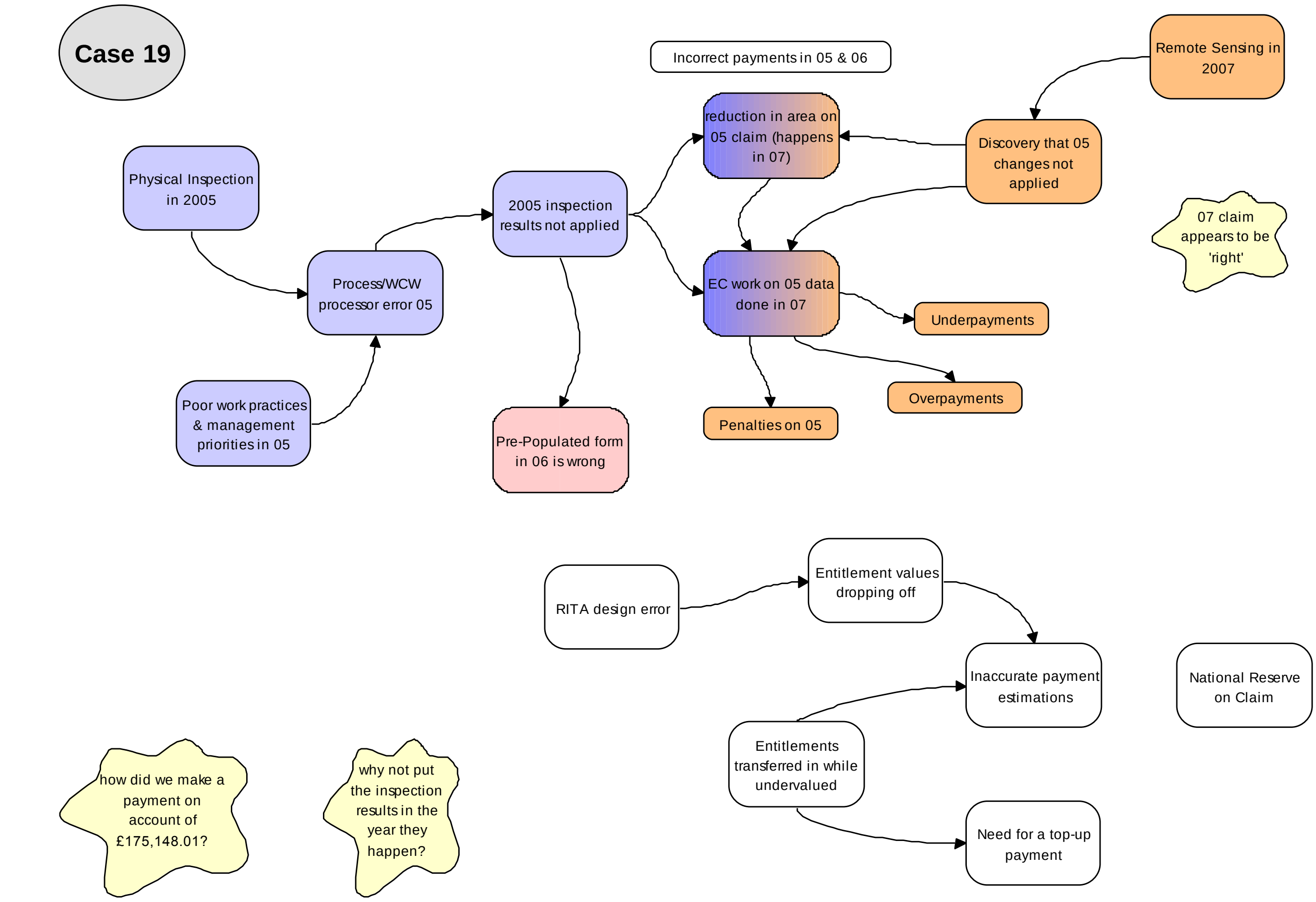


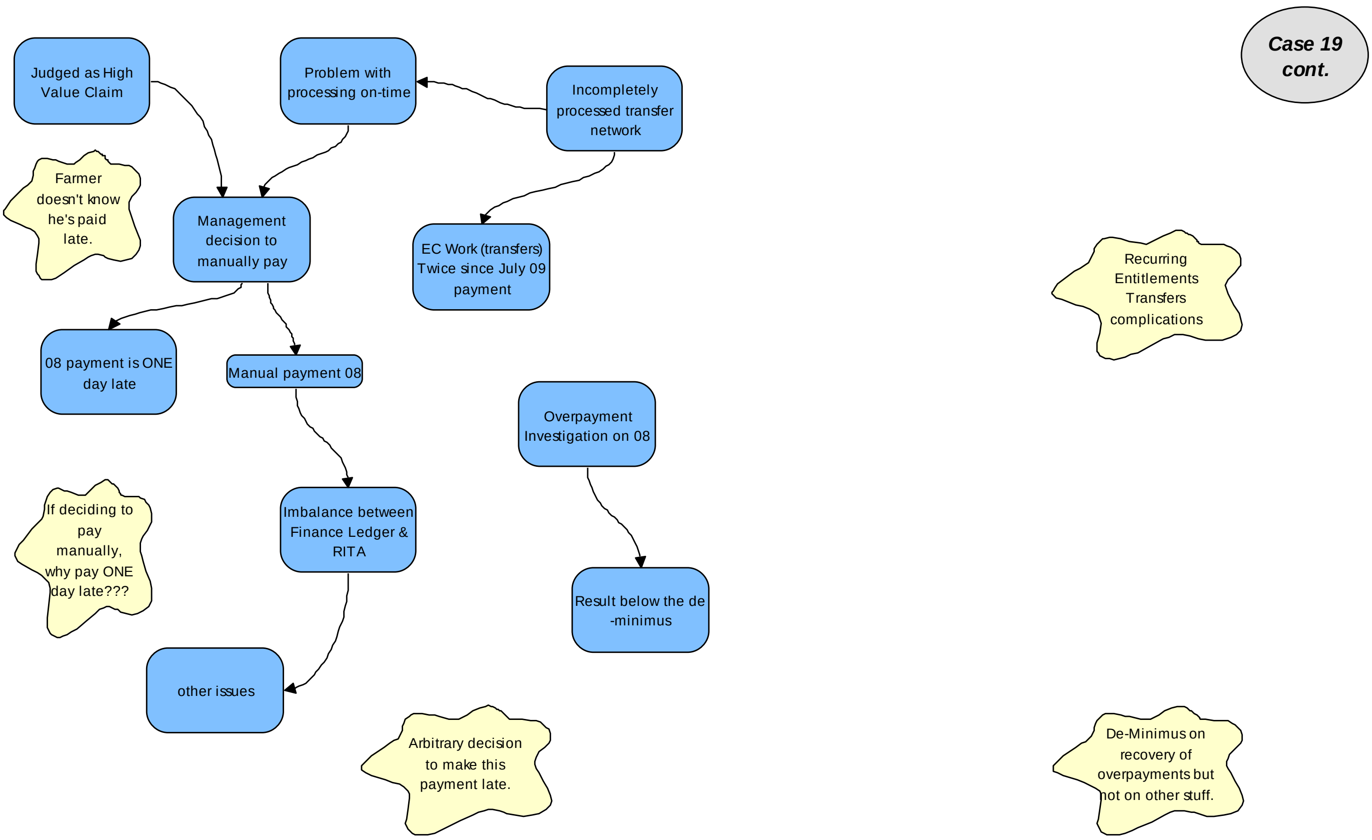
Case 15
Claim brought in to Drop-In Centre
ONE working day late; TWO calendar days late
farmer error
Claim submitted late
DMU notifies Farmer of 1% Penalty
Upset farmer
System Design Error
in-year penalty reduces claim amount
no symmetry in the power relationship between the customer and the civil servant
Processing proceeds normally
RITA error, doesn't realise weekends are not working days
2% Penalty applied by RITA
Stupid set of rules
IT System Error spotted by RPA (late)
1% top-up required
Late Payment
EU Penalty

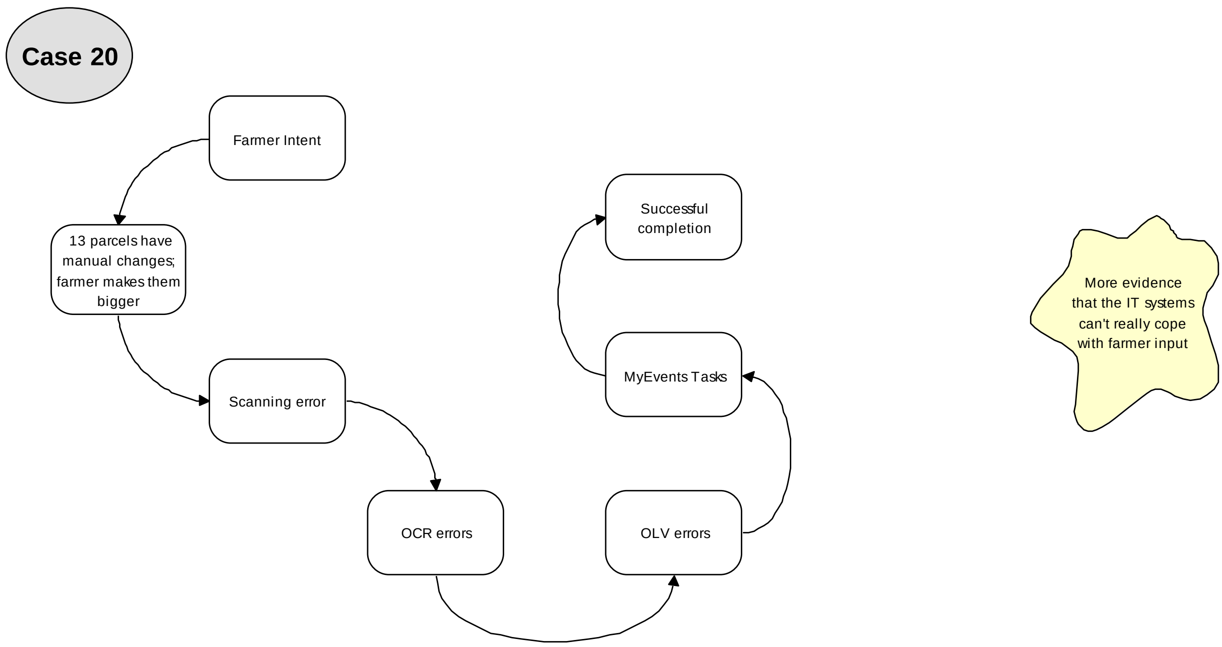

Case 16
Common reevaluation: Annual
Policy
Why do we validate commons every year?
Where is the source of the change? Commons council? Commons Agency? WHO?
Moorland & SDA Redefinition work needed on 07 claim
Entitlement Adjustment on the common
Commons Livestock Units change on 2 parcels
Decrease of the number of established entitlements on the Common
Commons processor error on 07 processing does not cascade changes to the whole common 07
Poor training/execution
Entitlement Value for Common Increased
we choose to carry out corrective work, post payment to employ resource
Top-up payment on 08
System drops field data off, unpredictably... has the possibilty to happen to any claim
Above is 07-08 changes; blue is 06 to 07 claim year
tactical decision and/or system requirement/design error
Pre-Population error on 06 claim (drop in sheep numbers)
Farmer confused
Pre-Population Errors (ie data falling out, rather than late errors corrected) must be happening to all claims not just those in our selections.
IT System error or Timing in taking data
07 claim form sent out with incorrect data
Significant Typo on one piece of correspondence -Letters don't draw directly from data; allows WCW error.
Lack of audit/reconciliation to ensure you're not missing fields off any claim


Case 17
Farmer intent
Falls in gap between IT implementation & testing
Policy misinterpreted
Policy - We changed land codes
Who dunnit re: policy EU or DEFRA & what was the intent?
Farmer submits claim with a land parcel with an incorrect land code
IT system rule error
RITA deletes entire field entry
No obvious exception reporting
Underpayment made on 08 claim
Unknown event
SMU notice large scale error
You put the wrong code, we delete your fields
Processor re-enters field with correct code
Don't mess with the RPA
Top Up Payment


Case 18
Claim received
Changes to the Common data made on 08 claim
RITA Error in syntax Common name
Late payment
Probably artificially moved through by Accenture
WCW work to close error
claim processed (second time)
Entitlements register not linked to RITA at all, so any mismatch has to be found manually, then results are plugged back into RITA for proceeding
Claim fails mismatch (MyEvents)
OLV run (12/08/08) (28/07/09)
Claim passes mismatch
Claim disappears
MyEvents Commons task raised
Commons work off-RITA finished
Policy decision to manually move mismatched claims
Someone notices this claim is not where it should be
Commons task Auto-Closed
deliberately not looking at mismatch/ entitlements until very late in the CY, which seems odd, given all the prepop
no function in RITA to check submitted entitlements to entitlements register, so SMU checks manually
Possibly OPT looking for Tail cases


Case 19
Incorrect payments in 05 & 06
Remote Sensing in 2007
Physical Inspection in 2005
reduction in area on 05 claim (happens in 07)
Discovery that 05 changes not applied
2005 inspection results not applied
07 claim appears to be 'right'
Process/WCW processor error 05
EC work on 05 data done in 07
Underpayments
Poor work practices & management priorities in 05
Overpayments
Penalties on 05
Pre-Populated form in 06 is wrong
RITA design error
Entitlement values dropping off
Inaccurate payment estimations
National Reserve on Claim
Entitlements transferred in while undervalued
Need for a top-up payment
how did we make a payment on account of £175,148.01?
why not put the inspection results in the year they happen?


Case 19 cont.
Judged as High Value Claim
Problem with processing on-time
Incompletely processed transfer network
Farmer doesn't know he's paid late.
Management decision to manually pay
EC Work (transfers) Twice since July 09 payment
08 payment is ONE day late
Manual payment 08
Recurring Entitlements Transfers complications
Overpayment Investigation on 08
If deciding to pay manually, why pay ONE day late???
Imbalance between Finance Ledger & RITA
Result below the de-minimus
other issues
Arbitrary decision to make this payment late.
De-Minimus on recovery of overpayments but not on other stuff.



Case 20
Farmer Intent
13 parcels have manual changes; farmer makes them bigger
Scanning error
OCR errors
OLV errors
MyEvents Tasks
Successful completion
More evidence that the IT systems can't really cope with farmer input

APPENDIX 8D: CODING ANALYSIS BY CASE

Case number	Event	Initial coding
1	scheme change	scheme change
1	new pony paddock in 2005	claim land data change
1	no prep pop claim form	scheme change
1	manual entry of data	HVDC
1	map creation required in RLR	Standard mapping
1	creating base data	claim land data change
1	farmer fills out forms and maps	farmer intent
1	farmer claims pasture and not arable	farmer intent
1	rpa does not tell him of under claim	miserly culture
1	ineligible parcel created by RPA in RLR	Error in application of SPS rules
1	Processor error in mapping an ineligible parcel (2X parcels under min value)	Error in application of SPS rules
1	2006 prepop drops 2 parcels of pasture	Pre-Population Drop Error
1	farmer activates arable to keep 0.5 claim size	farmer intent
1	2007 prepop drops pasture	Pre-Population Drop Error
1	creates two parcels; one illegal/total illegal	Error in application of SPS rules
1	illegal claim sent out by rpa	IT system error
1	illegal claim sent out by rpa	Error in application of SPS rules
1	RITA deletes illegal parcel	RPA tactics
1	30% claim reduction penalty	Scheme rules
1	claim disallowed and 3 year penalty	Scheme rules
1	processing produces rule violating payment	IT system error

Case number	Event	Initial coding
2	policy	Policy RPA
2	separate land and E's	Policy RPA
2	prepop form with no E's sent out	Policy RPA
2	farmer submitting zero value claim form	farmer intent
2	E's transferred out in toto (some land held)	farmer intent
2	RPA have six weeks to do this	EU Regulations
2	new scheme	Scheme change
2	HVDC 2005	HVDC
2	low skill agency resource	RPA tactics
2	data entry HVDC 2005	2005 land data error
2	EC is done	EC
2	E adjustment ripple effect, from 07 back and forward in time and claim years	EC Time Ripple
2	E adjustment ripple effect, from 07 back and forward in time and claim years	EC Land Ripple
2	inspection finds ineligible feature 4.5ha	Inspection
2	adjust land and E in year	standard inspection processing

2	EC cascades across the entire network and spiders web	EC Land Ripple
2	OP investigation	Payment – Over
2	UP investigation	Payment – Under
2	more work	Resource Consumption
2	more work	Cost Consumption
2	more work	Time Consumption
2	cost	Cost Consumption
2	accuracy effect	Accuracy Drive
2	top up payment	Payment - Top-Up
2	reporting skew	Reporting Skew

Case number	event	Initial coding
3	interpretation of CLR	Commons Standard Processing
3	E value increases on common land	Commons Standard Processing
3	adjustment of past payment	Common Entitlement Ripple
3	multiple payments	Payment - Top-Up
3	multiple payments	Payment - Under
3	scrutiny by Defra / EU	EU Penalty
3	claim data altered to be wrong	Processor Error
3	prepop data taken on X date	Cycles Deadlines & Load mismatch
3	dateline Jan pre all work done	Cycles Deadlines & Load mismatch
3	prepop data picked up correctly from fields in RITA but data wrong	Entitlements Wrong
3	farmer adjusts error	Farmer intent
3	poor C8/C12 rules	IT system error
3	manual WCW intervention to adjust C8/C12 problems	standard claim processing
3	late multiple payment reporting skew	
3	over lapping time periods	

Case number	event	Initial coding
4	Claimant makes no change	Farmer intent
4	stable claim data	Stable Claim Data
4	easily processed in rita	standard claim processing
4	easily processed in rita	successful completion
4	normal commons working	Commons Standard Processing
4	interpretation of CLR	Commons Standard Processing
4	changes to another SBI affect this SBI	Commons Land Ripple Annual
4	routine entitlement changes	Common Entitlement Ripple
4	unstable commons data	Commons Land Ripple Annual
4	payment made after window closed	Payment – Late
4	late payments	Payment – Late
4	late payments reporting skewed	Reporting Skew
4	commons entitlement adjustment	Commons Standard Processing
4	wrong payment made in past	Payment – Over

4	overpayment investigation	Payment – Over
4	recoveries	Payment - Recovery
4	top up	Payment - Top-Up
4	do nowt	Fear Culture
4	upset farmer	Farmer unhappy

Case number	event	Initial coding
5	farmer signs form to show intent	farmer intent
5	farmer signs form to show intent	miserly culture
5	no farmer input on C8	farmer error
5	C8 not prepopped	IT system error
5	claim received with no activated entitlements	farmer error
5	C8 not prepopped in subsequent years	standard claim processing
5	OLV error	standard claim processing
5	no changes made to entitlements	standard claim processing
5	if C8 popped rita will try to pay	standard claim processing
5	correction letter sent late after deadline	Cycles Deadlines & Load mismatch
5	no response before deadline	Cycles Deadlines & Load mismatch
5	claim ineligible	Scheme rules
5	no payment	standard claim processing
5	farmer finds SP6 form	Scheme rules
5	farmer appeals	Appeal processing
5	appeal rejected	Appeal processing
5	poor farmer	miserly culture

Case number	event	Initial coding
6	RITA cannot handle timing differences in transfers and correction sequence	IT system error
6	multiple E's transferred on multi SBI's	EC Land Ripple
6	EC on E transferred to multiple SBI's	EC
6	lots of work	Time Consumption
6	resource consumption	Resource Consumption
6	cost	Cost Consumption
6	network management	IT system error
6	processual takt/lag time exceeds available time	Time Consumption
6	partial payment may 09	Payment - Partial
6	match up payments RITA vs manual exercise	RPA tactics
6	match up payments RITA vs manual exercise	IT system error
6	match up payments RITA vs manual exercise	Non-standard processing
6	farmer gets some money before deadline	Payment - Under
6	uncertainty in farmers mind	Farmer unhappy
6	insufficient resource	
6	late potential claim	Time Consumption
6	mgt policy	RPA tactics
6	decide to pay	RPA tactics
6	deadline	Scheme rules
6	rules on EC's and transfer	

6	EC can lead to EV changes through the network	
6	early IT system didn't track date of transfers which is odd in a time critical system	

Case number	event	Initial coding
7	IT system error C8/C12	IT system error
7	manual WCW intervention	standard claim processing
7	bad instructions	Change Management
7	policy stuff	Change Management
7	lots of versions	standard claim processing
7	adjust field data in RLR & claim	standard claim processing
7	adjust field data in RLR & claim	Standard mapping
7	farmer manually adjusts prepop	farmer intent
7	farmer doesn't understand mapping guidelines	Customer Guidance Error
7	remote sensing was done	EU Regulations
7	data align rather than correct	
7	just get the damn thing through OLV	
7	calculation	
7	decoupling	
7	why bother with land use codes	
7	alignment sends it thru, not accuracy	
7	change from tasks to WCW bad training	
7	business didn't really utilise this	
7	not right but tasks done	
7	bodged it on paper files	
7	RS originally crop based in summer	
7	aim of originally process tasks holistically on a claim rather than individually	
7	berries and cherries set up entitlements could come out of those crops and still have SP due	
7	RS aug 2009 for may/june 2009 claim year checks mapping and land use and good order but don't care about land use in SPS	

Case number	event	Initial coding
8	farmer intent in yr 0	farmer intent
8	14 new parcels added to form in yr0	claim land data change
8	rita rlr extract taken in yr0	standard inspection processing
8	remote sensing done yr 0	standard inspection processing
8	2005 maps inaccurate yr-3	2005 land data error
8	adjust land parcel data yr0	standard claim processing
8	laugh at farmer for under claim	miserly culture
8	fields not in rlr	claim land data change
8	unrecognised field code	farmer wrong field code
8	OLV errors	standard claim processing
8	adjusted land data	standard claim processing

8	yr-3-2-1 2.34 Ha land	EC
8	EC work	EC
8	laugh at farmer for under claim	miserly culture
8	adjust entitlements for -3-2-1	EC
8	overpayment investigation	Payment – Over
8	wcw verifies RS results with farmer	Standard claim processing
8	if one person does all op and EC work it might lead to different outcome	
8	RS cases /OLV error forced flow to my events - complete mess	
8	offsetting overs and unders and knowledge and role	
8	this work contributes to this possibly a risky claim and having an inspection	

Case number	event	Initial coding
9	farmer intent	farmer intent
9	sends in correct maps	standard claim processing
9	RPA maps 05 incorrectly	2005 Land Data Error
9	RPA merged two parcels in RLR but didn't increase total area	Mapping Error
9	RITA raises alert that the claimed area doesn't equal the mapped area	standard claim processing
9	bad training/practice	Change Management
9	Error disregarded by WCW	Processor Error
9	Farmer has fewer entitlements than he should	Entitlements Wrong
9	Pre-Pop error	Data for following Pre-Population wrong
9	2007 form submitted with corrections	farmer intent
9	Corrections ignored for calculations	IT system error
9	Corrections ignored for calculations	Processor Error
9	Underpayment in 05/06/07	Payment – Under
9	unhappy farmer	Farmer unhappy
9	top-up late payment generated (05-08)	Payment - Top-Up
9	EC work increases entitlements back to 05	EC Time Ripple
9	Parcel remapped correctly	Standard mapping
9	Letter from farmer in 08 with claim form pointing out the discrepancy	Farmer intent
9	proper processing of 08 claim	standard claim processing
9	on-time payment in 08	successful completion
9	We don't tell him he is underclaiming against his potential	
9	Insufficient feedback loops	
9	dunno if the 08 payment was accurate; EC work may have been done after payment	

Case number	event	Initial coding
10	farmer intent	farmer intent
10	scanning drops parcel with invalid codes	farmer wrong field code
10	scanning drops parcel with invalid codes	IT system error
10	scanning drops parcel with invalid codes	system maintenance error

10	rpa notices a bunch of these	Non-standard processing
10	briefing note by SMU on how to fix	Non-standard processing
10	WCW work to correct	standard claim processing
10	WCW work to correct	Resource Consumption
10	top up payment before deadline	Payment - Top-Up
10	claim processed without farmer adjustments	IT system error
10	UP goes out	Payment – Under
10	EC work	EC
10	floating decimal point error drops EV by 0.008p	IT system error
10	recovery of OP of 0.76p	Payment – Recovery
10	counts as OP in reporting	Reporting Skew
10	skewed reports	Reporting Skew

Case number	event	Initial coding
11	Tactical management decisions (avoid due to Tech, ignorance, etc.)	RPA tactics
11	2005 Inspection performed	Inspection
11	Delay in sorting land-based discrepancies in 05 claim	Delay
11	Adjustments to Land Data; ineligible areas and smaller fields	standard claim processing
11	farmer appoints agent	farmer intent
11	RITA unable to process inspections	
11	created extra work RPA can't process	IT system error
11	Agent pressures RPA which speeds things up	Farmer intent
11	Delay in processing	Delay
11	Wrong payment	Payment – Over
11	Pressure to push payments out AFTER deadline	RPA tactics
11	Farmer receives partial 2005 payment (May 2006)	Payment – Partial
11	Late Payment	Payment – Late
11	RPA sends out land data	standard claim processing
11	Farmer tries to correct data	farmer intent
11	RPA does not apply farmer's or inspection's corrections	Processor Error
11	RPA does not apply farmer's or inspection's corrections	IT system error
11	05 claim remains wrong	2005 Land Data Error
11	2005 claim re-processed to generate OP (Oct 08)	standard claim processing
11	2005 claim re-processed to generate OP (Oct 08)	Payment – Over
11	06 Claim pre-popped wrong	Data for following Pre-Population wrong
11	Farmer signs and returns 06 claim form	farmer intent
11	07 Claim pre-popped wrong	Data for following Pre-Population wrong
11	2007 payment made Feb 08	successful completion
11	2006 payment made on-time, but wrong	Payment – Over
11	Penalty applied on 06 claim in Feb 08	Penalty – Farmer

11	*Bad land data effects downstream payments, penalties, adjustment, etc.*	
11	*2005 instability rolls in to 2006*	
11	*Not dealing with Ops in winter 07-08. (run and hide: too busy getting other work done.)*	
11	*Reactive mgmt: fear of EU penalties; reluctance to confront Ops*	
11	2008 payment on hold	standard claim processing
11	agree to offset payment against 2008 payments	standard claim processing
11	Two claims for same SBI, consecutive years, processed ok through RITA but with uncorrected errors	IT systems error
11	True debt check done; appeal rejected	Non-standard processing
11	True debt check done; appeal rejected	Appeal processing
11	Farmer appeals	Farmer intent
11	Penalty can cause overpayment	
11	Penalty raised Jan 2007 (at start of payment window 2006) on 05 Claim	Penalty – Farmer
11	Land analysis via inspection	Inspection
11	Land analysis via inspection	standard claim processing
11	Penalties at RPA not able to be applied until 2006	
11	RLR may not have been updated with inspection results	
11	Why did nobody sort this one out? There was no architecture, knowledge, tools to mend the problem.	

Case number	event	Initial coding
12	External to RPA action on CLR	Commons standard processing
12	Commons register changes	Commons standard processing
12	Whole Common change identified	Commons standard processing
12	Reduction of land size of Common (affecting multi-years)	Commons standard processing
12	Reduces this claim's Hectarage, which is backdated to 05.	Common Land Ripple
12	Entitlements reduced	Common Entitlement Ripple
12	OP recovery action	Payment – Recovery
12	EU rules	EU Regulations
12	Reduction spotted by agent; not via update given by RPA in May 07	Non-standard processing
12	Agent appointed	farmer intent
12	farmer intent	farmer intent
12	Shroedinger's Cat: claim accurate and inaccurate at the same time	
12	Delay caused by management burying head in sand.	Delay
12	Delay caused by management burying head in sand.	RPA tactics
12	RITA requirement or design error	

12	Process or IT system error allowing gap	IT system error
12	RITA error drops off moorland entitlements and pays only flat rate	IT system error
12	Neither RPA or Farmer notices	
12	Missed required error correction	Processor Error
12	Underpayment	Payment – Under
12	Top-Up payments (on 06-07 made in 08)	Payment - Top-Up
12	EC	EC
12	Entitlement drops off between 05 & 06	IT system error
12	Bad data entry from 05 claim form	2005 Land Data Error
12	HVDC error	HVDC
12	New scheme	Scheme change
12	people-error	Processor Error

Case number	event	Initial coding
13	farmer dies in nov 07	customer data change
13	07 bacs rejected	bank error
13	payment by cheque	bank error
13	rpa notified of probate feb 08	standing data change
13	hold placed on 08 payment	standard customer data processing
13	waiting for grant of probate	standard customer data processing
13	case goes into tail	standard customer data processing
13	probate finalised	standard customer data processing
13	daughter on claim in 08	standard customer data processing
13	sbi moved to daughter in 09	standard customer data processing
13	daughter on claim in 08	standard customer data processing

Case number	event	Initial coding
14	owner and tenant intent	farmer intent
14	RLE1 form received	Entitlement data change
14	RLE1 form does not reflect intent	farmer error
14	E's revert back to owner per RLE1 form	Standard Entitlements processing
14	claimant claims on expired leased E's in 08	farmer error
14	no payment 08 for leased E's	standard claim processing
14	no RLE1 form submitted for 08	Entitlement data change
14	stage 1 appeal received on 08 claim	Appeal processing
14	appeal rejected	Appeal processing
14	RLE1 form received 09 with no close date	Entitlement data change
14	RLE1 form received 09 with no close date	farmer error
14	IT system error allowing open transfer	IT system error
14	RLE1 team error allowing open transfer	Processor error

Case	event	Initial coding

number		
15	claim brought to drop in centre	farmer intent
15	farmer error	farmer error
15	claim one working day, 2 calendar days late	miserly culture
15	claim submitted late	farmer error
15	processing proceeds normally	standard claim processing
15	2% penalty applied by rita	IT system error
15	in-year penalty reduces claim amount	standard claim processing
15	dmu notifies farmer of 1% penalty	standard claim processing
15	upset farmer	Farmer unhappy
15	system design error	IT system error
15	rita doesn't know it is not working day	system maintenance error
15	IT system error spotted by RPA (late)	Non-standard processing
15	1% top up required	Non-standard processing
15	late payment	Payment – Late
15	EU penalty	EU Penalty

Case number	event	Initial coding
16	tactical decision and or system reqt design error	RPA tactics
16	tactical decision and or system reqt design error	IT system error
16	IT system error or timing in taking data	IT system error
16	IT system error or timing in taking data	Cycles Deadlines & Load mismatch
16	prepop error on 06 claim (drop in sheep numbers)	Pre-Population Drop Error
16	07 claim form sent out with incorrect data	Data for following Pre-Population wrong
16	Policy	Policy RPA
16	common reevaluation annual	Commons Standard Processing
16	commons LU change on 2 parcels	Commons Standard Processing
16	Moorland and sda redefinition work needed on 07 claims	Commons Standard Processing
16	commons processor error on 07 processing does not cascade to whole common 07	Commons Standard Processing Error
16	poor training execution	Change Management
16	entitlement adjustment on the common	Common Entitlement Ripple
16	decrease of the number of established E's on common	Common Entitlement Ripple
16	E value for common increased	Common Entitlement Ripple
16	top up payment on 08	Payment - Top-Up
16	farmer confused	Farmer unhappy
16	we choose to carry out corrective work post payment to employ resource	
16	system drops field data off, unpredictably - has the possibility to happen to any claim	
16	pre pop erros (ie data falling out, rather than late data corrected must be happening to al claims, not justthose in our selections	
16	lack of audit / reconciliation to ensure no missing fields off any claim	

16	significant typo on commons correspondence - letters don't draw directly from the data; allows wcw error	

Case number	event	Initial coding
17	farmer intent	Farmer intent
17	farmer submits claim with wrong field code	Farmer wrong field code
17	rita deletes entire field entry	IT system error
17	underpayment made on 08 claim	Payment – Under
17	unknown event	
17	smu notice large scale error	Non-standard processing
17	processor reenters field with correct code	standard claim processing
17	top up payment made	Payment - Top-Up
17	falls in gap between IT implementation and testing	IT system error
17	policy misinterpreted	RPA policy
17	policy we changed land codes	Change Management
17	who dunnit re:policy EU or DEFRA and what wwas the intent	
17	no obvious exception reporting	
17	you put the wrong code, we delete your fields	
17	don't mess with the RPA	

Case number	event	Initial coding
18	claim received	standard claim processing
18	changes to the common data made on 08 claim	Commons Standard Processing
18	rita error in syntax common name	
18	WCW work to close error	Commons Standard Processing
18	OLV run 08/08 and 07/09	IT system error
18	OLV run 08/08 and 07/09	Non-standard processing
18	claim fails mismatch	Commons Standard Processing
18	policy decision to manually move mismatched claims	RPA tactics
18	claim passes mismatch	Commons Standard Processing
18	claim disappears	IT system error
18	claim processed second time	Non-standard processing
18	late payment	Payment – Late
18	my events commons task raised	standard claim processing
18	commons work off rita finished	Commons Standard Processing
18	commons task autoclosed	RPA tactics
18	someone notices this claim is not where it should be	Non-standard processing
18	no function in rita to check submitted entitlements to ER so smu checks manually	

18	deliberately not looking at mismatch entitlements until very late in claim year which seems odd given all the prepop errors	
18	ER not linked to rita at all, so any mismatch has to be found manually,then results are plugged back into rita for processing	

Case number	event	Initial coding
19	Physical inspection 2005	Inspection
19	Poor work practices and management priorities in 05	RPA tactics
19	Process/WCW processor error in 05	Processor Error
19	2005 inspection results not applied in 05	Processor Error
19	Pre-pop form in 06 is sent out wrong	Data for following Pre-Population wrong
19	Reduction in area on 05 claim (happens in 07)	EC Land Ripple
19	EC work on 05 data done in 07	EC
19	Penalties on 05	Penalty – Farmer
19	Overpayments	Payment – Over
19	Underpayments	Payment – Under
19	Discovery that 05 changes not applied	Non-standard processing
19	Remote Sensing in 07	Inspection
19	07 Claim appears to be 'right'	
19	RITA design error	IT system error
19	Entitlement values dropping off	IT system error
19	Inaccurate payment estimations	Non-standard processing
19	Entitlements transferred in while undervalued	Entitlements Wrong
19	need for a top-up payment	Payment - Top-Up
19	Incorrect payments in 05 & 06	Payment – Under
19	How did the RPA make a payment on account of £175,148.01??	
19	Why not put the inspection results in the year they happen?	
19	Judged as high-value claim	RPA tactics
19	Management decision to manually pay	RPA tactics
19	Farmer doesn't know he's paid late	
19	08 Payment is ONE day late	Payment – Late
19	Manual payment 08	Payment – Manual
19	Incompletely processed transfer network	Cycles Deadlines & Load mismatch
19	EC work (transfers) Twice since July 09 payment	EC
19	Overpayment investigation on 08	Non-standard processing
19	Result below the de-minimus	IT system error
19	Imbalance between Finance Ledger & RITA	IT system error
19	Other issues	
19	If deciding to pay manually, why pay ONE day late??	
19	Arbitrary decision to make this payment late.	
19	National Reserve on claim	standard claim processing
19	Typical entitlements transfers mess	
19	De-Minimus on recovery of overpayments, but not on other stuff.	

Case number	event	Initial coding
20	farmer intent	farmer intent
20	farmer changes 13 parcels	claim land data change
20	scanning error	scanning error
20	ocr errors	OCR errors
20	olv errors	standard claim processing
20	my events tasks	standard claim processing
20	successful completion	successful completion
20	evidence that the IT systems cant cope with farmer input	

APPENDIX 8E: LIST OF INITIAL CODES

	Count of count	
	early codes	Total
1	2005 land data error	5
2	Accuracy Drive	1
3	Appeal processing	5
4	bank error	2
5	Change Management	5
6	claim land data change	5
7	Common Entitlement Ripple	6
8	Common Land Ripple	1
9	Commons Land Ripple Annual	2
10	Commons Standard Processing	17
11	Commons Standard Processing Error	1
12	Cost Consumption	3
13	customer data change	1
14	Customer Guidance Error	1
15	Cycles Deadlines & Load mismatch	6
16	Data for following Pre-Population wrong	5
17	Delay	3
18	EC	9
19	EC Land Ripple	4
20	EC Time Ripple	2
21	Entitlement data change	3
22	Entitlements Wrong	3
23	Error in application of SPS rules	4
24	EU Penalty	2
25	EU Regulations	3
26	farmer error	7
27	farmer intent	25
28	Farmer unhappy	4
29	farmer wrong field code	3
30	Fear Culture	1
31	HVDC	3
32	Inspection	5
33	IT system error	28
34	Mapping Error	1
35	miserly culture	4
36	Non-standard processing	14
37	OCR errors	1
38	Payment – Late	6
39	Payment – Over	8
40	Payment – Partial	2
41	Payment – Recovery	3
42	Payment - Top-Up	9
43	Payment – Under	9

44	Penalty – Farmer	3
45	Policy RPA	4
46	Pre-Population Drop Error	3
47	Processor error	9
48	Reporting Skew	4
49	Resource Consumption	3
50	RPA policy	1
51	RPA tactics	14
52	scanning error	1
53	scheme change	3
54	Scheme rules	5
55	Stable Claim Data	1
56	standard claim processing	33
57	standard customer data processing	7
58	Standard Entitlements processing	1
59	standard inspection processing	3
60	Standard mapping	3
61	standing data change	1
62	successful completion	4
63	system maintenance error	2
64	Time Consumption	4
65	Payment – Manual	1
	Grand Total	345

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