Power and politics in the adoption of information systems by organisations: The case of a research centre in Latin America

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To the memory of my grandfather Federico Guillermo Silva Amézquita.

Abstract

This thesis applies contributions from the social sciences to the study of power to examine how and why organisations adopt information systems. Its main concern is the set of events, actions and factors that induce an information system to become routinised in the organisational life; that is how information systems become institutionalised. I argue that the actions and events that lead to the adoption and subsequent institutionalisation of an information system are politically motivated and facilitated by power relations because information systems are chiefly instruments used by organisational actors to achieve their goals. To develop the argument I have adapted and interpreted a model rooted in social and organisational sciences. This model is used as a theoretical framework for the collection and analysis of data of two case studies. The first case centres on the collapse of the London Ambulance Service in 1992. The second and major case study focuses on a research centre in Latin America. This case study accounts for the adoption and institutionalisation of three information systems in that organisation. The application of the theoretical framework constitutes a contribution in researching power and politics of information systems because it illustrates how to link data to the theory. This thesis also contributes to the theory of power and information systems because the findings of the two case studies allowed us to make inferences that complement the original theoretical model. Furthermore, those findings are propositions that information systems practitioners might convert into useful principles in assessing the political base and power relationships of the organisation for which they work. The thesis concludes by asserting that the adoption and institutionalisation of an information system necessarily imply the exercise of power of those organisational actors that own or propose the system.

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Chapter One

Research Issues

1.1 Scope of the Research

The relationship among power, politics, information systems and organisations has been the centre of several studies in our field. These studies have concentrated on different power issues such as the interaction between users and designers, the possible conflict between managers and workers, and the use of information systems as instruments of domination. These are undoubtedly interesting topics addressing relevant questions most of them rooted in the information systems life cycle. The motivation for this research, however, arises from asking a question that has not been fully addressed: why is it that sometimes poorly designed information systems are adopted and institutionalised in organisations? Or putting it in a different way: why is it that sometimes well designed information systems are not adopted or used by organisations? Those with organisational experience surely know that often the adoption and use of information systems do not depend completely on analysis or design factors. This thesis argues that the reasons for the adoption and institutionalisation of information systems[1] by organisations can be understood if they are seen from a political and power perspective. Our argument, in this dissertation is that the actions and events that lead to the adoption and subsequent institutionalisation of an information system are mainly politically motivated and

[1]Our conception of information systems is not restricted only to physical artefacts but is concerned with actions and communication among organisational members (Liebenau and Backhouse 1990). It includes both social and technical components.

facilitated by power relations because information systems chiefly are instruments used by organisational actors to achieve their goals.

The theme of this thesis is the politics and power relations in the adoption of information systems by organisations. This is pertinent, especially now, that organisations increasingly are relying on external sources for developing and designing their information systems or are adopting ready-made technology (Willcocks and Fitzgerald 1994; Gurbaxani 1996; Nam, Rajagopalan et al. 1996; Slaughter and Ang 1996; Tye and Chau 1995). For McFarlan and Nolan (1995) organisations are relying more and more on outsourcing as their concern on costs and quality increases. Accordingly, organisations that obtain their information services by outsourcing need to learn not only how to deal with outsourcing firms (Lacity et al. 1995) but also how to cope with the factors that either boost or hinder the fit between the services and the organisational setting. Furthermore, organisations are realising that among the main factors of what some scholars call information systems failure are political and power factors (see Davies et al. 1992; Drumond 1996; Mitev 1996; Flowers 1997; Hart 1997; McGrath 1997; Mitev 1997; Rada 1997; Silva and Backhouse 1997; Silva et al. 1997; Warne 1997). Along with the power issues of outsourcing and the political factors that contribute to the failure of information systems, the study of power is also relevant as organisations are adopting off-the-shelf information systems.

Organisations also adopt ready-made technology such as e-mail, Internet or intranets. The adoption of these technologies might be driven either by particular organisational members or by external factors that go beyond the scope of organisational action as the institutional approach to organisations shows (DiMaggio and Powell 1983; DiMaggio 1988; Meyer and Rowan 1991; Powell and DiMaggio 1991; DiMaggio and Powell 1991a; Scott 1995). This suggests that, whatever the driving force, the adoption of technologies might often be influenced by political and power factors, either endogenous or exogenous (Markus 1994; Abdulgader and Kozar 1995; Premkumar and Potter 1995; Prescott 1995; Tye and Chau 1995; Harrison et al. 1997). Thus, the trend to outsource information systems services and the adoption of ready-made technologies by organisations indicate the relevance of researching the political and power factors behind the institutionalisation of information systems. The

key issue in our research is institutionalisation since this concept connotes power, stability and permanence. Let us now introduce our notion of institutionalisation.

Institutionalisation is the reciprocal typification of habitualised actions. An institutionalised practice or system constitutes a psychological gain because it provides a stable background in which actions are often performed with a minimum of effort in decision-making (Berger and Luckman 1967). Institutionalisation, then, frees energy that can be channelled to other projects or enterprises. Hence the institutionalisation of information systems might open opportunities for innovations in other areas for managers, designers and users. The institutionalisation of information systems can be understood from a power perspective because institutions control and facilitate actions (Ibid.). Stinchombe (1968: 107) emphasised the role of power in institutionalisation. He defined an institution as a "structure in which powerful people are committed to some value or interest." He emphasised that, in this context, interests and values will be preserved only if those holding them are powerful. Thus, institutionalisation implies both power and stability in the long term.

The process of institutionalisation has been central for some researchers of organisational studies. According to Clegg (1990), there are two streams in the institutional school of organisation studies, one in the East coast of the US, and the other is in the West. Meyer and Rowan (1991), who are based in the West, concentrate on the processes that lead to the institutionalisation of rules, how they are brought into being, and particularly how they become legitimate. They follow the phenomenological approach to institutions of Berger and Luckman (1967). DiMaggio and Powell (1983, 1991) in the East concentrate on how organisations structure themselves by taking elements from the environment; and use this to make sense of similarities among organisations. Although studying how organisations become similar is an interesting topic, we will follow the West-coast stream mainly for two reasons. First, because having phenomenology as its ontological stance, it makes it more suitable for interpretive and qualitative research, and second, because the focus of our research is on how information systems become legitimate and institutionalised within organisations.

As said above, the adoption, use and subsequent stabilisation of an information system constitute its institutionalisation. Yet, how can an institutionalised

information system be recognised? We can say that information systems become institutionalised when they are no longer considered as innovations but as unnoticed and unremarkable tools that people take for granted in doing their work; i.e. institutionalised information systems are noticed only when they break down (Winograd and Flores 1987). This is the starting point of our research. We believe it suggests two interesting questions that our thesis aims at answering; at least in the context of our case studies. How do certain organisational members make others use and adopt a new information system and what do those members proposing the information system do to make it stable and eventually institutionalised? We argue that the use and institutionalisation of an information system require the exercise of power by those who propose it. And we argue that information systems are instruments used by knowledgeable actors to achieve their outcomes. The whole thesis contains the development of our argument.

The theme of this thesis has two dimensions: one is theoretical while the other is empirical. One of our main purposes is to make a theoretical contribution to the study of power and information systems. In doing so, we have adapted a theory of power, the circuits of power, proposed by Clegg (1989). This theoretical framework is rooted in social and political sciences. Our contribution consists in adapting and interpreting Clegg's theory to the study of information systems. In doing so we were able to study how two organisations attempted to adapt and to institutionalise particular information systems. These are our two case studies. One was conducted, by drawing on secondary sources, in a British organisation -the London Ambulance Service. The second and main case study was carried out in a research centre in Latin America, specifically in Guatemala.

The main objectives of this thesis are therefore on the one hand to offer a theoretical framework that accounts for the power and politics of organisations when adopting and institutionalising information systems and on the other, to provide insights of that phenomenon by examining two case studies. The theory we propose is integral because it encompasses different approaches to power that far from being contradictory are complementary. Our research strategy, using interpretive case studies, allowed us to have access not only to the formal power structures of the organisation but also to the more hidden and subtle power relations known by some

organisational theorists as politics and many times regarded with a negative connotation. Mintzberg (1983), for example, regards it as illegitimate power and in the field of information systems Hirschheim and Klein (1994) call it the *dark side* of power. It is our belief that to understand the adoption and institutionalisation of information systems, researchers and practitioners need to shed light on that *dark side* of power. That is why we propose a theoretical approach and present empirical research that will help us to make sense of power relations in the context of information systems.

The rest of this chapter introduces and discusses the main research issues. The next section discusses the different conceptions of power and how these have influenced research on information systems. The chapter ends by presenting the overall structure of the thesis.

1.2 Overview of Power

Power is an elusive conception that like electricity or gravity is only known to us through its effects while its nature remains obscure (Barnes 1988). We are all familiar with military, political and even physical power, but its nature and essence escapes us. Likewise, it is very difficult to establish whether our actions are determined or not by external forces. This question has been in the centre of social and political sciences debate about power (Giddens 1984). It is this double dimension of power, evident in its effects and obscure in its nature, that makes power difficult to define. There are as many definitions of power as viewpoints on the subject (Russell 1938; Lukes 1974; Clegg 1975; Clegg 1979; Debnam 1984; Barnes 1986; Lukes 1986; Barnes 1988; Clegg 1989; Wrong 1995). That is why instead of attempting the almost impossible task of defining power we will present an overview of the different approaches to power within the social sciences.

Before introducing our typology let us ask four questions regarding the nature and essence of power. (1) Is power a capacity? (2) Is power synonymous with influence and hegemony? (3) Can an agent or individual store power? (4) If power can be stored what is its relationship with decision making? These four questions point to four different approaches on power that are not necessarily contradictory. To answer the questions we have drawn on the work of Law (1991) who classifies and

observes four types of power: ‘power to’, ‘power over’, ‘power storage’ and ‘power discretion’. The examination of those four types of power will allow us to classify the works regarding power and information systems and also to trace their intellectual roots. We use Law’s categorisation for analytical purposes only because we recognise that some of the studies discussed in the later sections may be classified in more than one type. However, we have classified each study under the category whose influence is predominant.

Law emphasises that these four forms of power should be treated as relational products. He understands social relations as composed not only of social agents, but also of material, technological and natural elements. To understand how social networks generate power effects and at the same time are also kept stable because of power, we need to make sense of how the ‘social’ is linked with the material. Furthermore, as Law himself puts it (p166): “we have to explore the way in which discursive ordering strategies in part shape, and are embodied in a range of different materials.” Thus, by co-ordinating these four approaches to power in a theoretical framework we should be able to understand and make sense of how the social and technological components of information systems become embedded in organisations. But first let us discuss the four types of power and examine how they have been approached by information systems researchers.

1.2.1 Power to

According to Law, ‘power to’ is power that enables. Barnes (1988), an exponent of this approach, deems that society enables individuals to act. He claims that we are able to do things by virtue of being members of society. Law also places Foucault (1977; 1980; 1982) as a proponent of this type of power. Foucault is classified in this category not only because of his conception of power as embedded in social relations but also because of his concern with discipline. Discipline in this sense concerns strategies, techniques and micro-techniques of power that operate through institutions and even bodies, such as for example armies. Neither Barnes nor Foucault think of power as a zero sum-game entity. They claim the opposite, that the sum of power parts is greater than the parts. Law characterises this type of power as productive and enabling, and so he dubs it ‘power to’.

The enabling features of information systems and information technology have been the focus of several researchers. Some of them influenced by Foucault's ideas have concentrated on the enabling characteristics of information systems when considering information systems as an electronic panopticon (Zuboff 1988; Sewell and Wilkinson 1992). There is another approach to information systems, the socio-technical, that views them as a means to conciliate the overall organisational interests of production and profit with those of job satisfaction held by the work-force (Mumford 1972; Mumford and Henshall 1979; Mumford 1987). These ideas have been taken further by Hirschheim and Klein (1994) who propose an information systems development methodology for emancipation. Thus, 'power to' has been central in the contributions of the above researchers; some think of information technology as enabling production and efficiency and others as an instrument for emancipation. The rest of this section discusses these ideas.

Foucault, the Panopticon metaphor and information systems

The panopticon was a site envisaged and devised by the British philosopher Jeremy Bentham during the early stages of the industrial revolution. He intended it as an instrument to exercise supervision and surveillance over prisoners.

> The design of the Panopticon consisted of a tower in the centre surrounded by a ring-shaped building composed of cells, each housing a prisoner. The Panopticon allowed for the continuous observation of inmates, while simultaneously requiring few supervisory resources (McHoul and Grace 1993: 67).

Bentham also thought that a panopticon built in a factory could enhance production. Once in place the panopticon would allow management to instil discipline in their subordinates by letting them know they were under surveillance all the time. Furthermore, the panopticon could give supervisors the opportunity to see their subordinates without the latter being able to see the former. Zuboff (1988) thinks of information technology as the electronic panopticon. She observes that new managerial techniques of control and surveillance are now supported by information technology. The electronic panopticon is represented by information technology (IT) as it avoids face-to-face contact between managers and employees. The electronic panopticon, Zuboff points out, makes work practices visible and emphasises the division of work. Hence an organisation where the electronic panopticon is in place, she claims, will not tolerate an authoritarian style of management. Consequently,

organisations will adopt a structure that legitimates more interaction and mutual influence, and therefore they will become more productive.

The work of Zuboff has been regarded as technologically deterministic and utopian by Knights and Murray (1994). Zuboff, they observe, believes that the adoption of information technology and the subsequent flows of information will make hierarchical structures more flexible, more horizontal. She supports her argument -as pointed out above- by indicating that an informed organisation will not tolerate authoritarianism. Knights and Murray consider that Zuboff's work is utopian because it does not account for how managers will give up their authority as the result of information systems. Although the implications of her research are questionable, there are some contributions in Zuboff's work that are relevant for the purposes of our research. One of these consists in showing how interpretive research can provide insights into how organisations adopt information systems. Furthermore, she indicates how the introduction of computer based information systems follows a concentration of forces and consequences that have and develop their own momentum. Managers, for instance, might challenge an information system if they perceive it is going to change their roles.

The panopticon metaphor is also central to the concept of discipline power. Discipline power is embedded in routinised social practices. The idea of the panopticon is that power will be internalised, regularised, and thereby power will secure traditional norms. On those under surveillance the panopticon produces a state of conscious and permanent visibility that enacts power. It creates the sensation within the individuals that surveillance is permanent, even if it is not; chiefly, because there is no way that individuals might establish whether there are people or not inside the panopticon. In short, the presence of the panopticon will create discipline power:

> Panopticism is the exemplary technique through which disciplinary power is able to function. For it relies on 'surveillance' and the internal training this produces to incite states of docility; it need not rely on displays of physical force or violence. Direct force represents merely frustrated or failed forms of discipline. The subject of surveillance, by contrast, disciplines him -or herself (McHoul and Grace 1993: 67).

Disciplinary power is the result of an organisational effort to regulate activities especially in time and space. Administrative authorities keep and record information about individuals in the form of personal life-histories. Besides collecting and keeping information, discipline power is also enacted by direct supervision

(Giddens 1985). The panopticon facilitates collection and storage of information and provides means of supervision and monitors behaviour. Thus, the panopticon enhances control by making work practices visible and ensures compliance from those who are under surveillance. Often in organisations compliance of individuals is achieved by coercive or economic sanctions (Clegg 1989; DiMaggio and Powell 1991).

An excellent example of how disciplinary power and the panopticon metaphor are related to information systems is in the work of Sewell and Wilkinson (1992). Sewell and Wilkinson focus on the JIT (Just-In-Time) and TQC (Total Quality Control) practices in the manufacturing environment. They argue that these JIT/TQC practices require systems of surveillance better than those offered by traditional bureaucracies; as production became more diverse, supervision has become more important. In this context, the purpose of surveillance systems is to instil discipline and to strengthen central control in order to make production more efficient. Sewell and Wilkinson argue that organisations achieve these goals by introducing two disciplinary forces.

The first of these forces operates at a horizontal level. It is exerted by the supervision in each manufacturing cell, quality circle or group, by peers. The second force is exerted by management information systems that act as surveillance and control systems. This is a vertical process that provides managers with a very close supervision of the shop floor. These two forces are important because JIT/TQC push responsibility downwards to identify responsibility for errors (Ibid.). Yet, along with responsibility, individuals should also be granted discretion. This leads to the decentralisation power paradox stated by Clegg (1989). The paradox consists in that managers will increase their scope of power by providing people in the shop floor with discretion. This way, buffer time usually spent in consultation is reduced, if not eliminated completely. However, managers might lose control of individuals that have been so empowered. To avoid this paradox, Sewell and Wilkinson suggest that, management information systems, acting as electronic panopticon, can support the empowerment of workers and at the same time keep managers informed about any eventuality that might hinder the achievement of the organisational objectives.

Disciplinary power is achieved as a result of the ability of electronic surveillance to expose individuals as the source of failure within a short time (Dandeker 1990).

One of the implications of this electronic panopticon might be the transformation of middle management. Sewell and Wilkinson argue that middle management will not disappear but it will be internalised by the electronic panopticon. Workers will know what to do and not do, as well as the consequences of their actions because of the pervasive surveillance of the electronic panopticon. Perhaps Sewell and Wilkinson have overestimated a bit the strength of management information systems in controlling individuals in organisations. Discipline power works when individuals know that they are under surveillance, once they know how to break the system, discipline ends. Dhillon (1995), for example, points out that many breaches of information systems in organisations are carried out by insiders. The panopticon metaphor shows limitations when responsibility of individuals is required. Moreover, the concept of discipline power was developed as a result of studying institutions such as prisons and hospitals where individual responsibility is restricted (Clegg, 1989). However, the work of Sewell and Wilkinson constitutes an alternative and very rich approach to the relation between power and information systems and suggests avenues for further research. One of these might be for example to research the extent the electronic panopticon can keep the balance between responsibility and central managerial control. Another interest area for further research might be to establish with more detail how discipline power is internalised and the process that leads to its sustainability.

A very in-depth reflection on Foucault's ideas and their relationship with information systems can be found in Introna (1997). He analyses information systems and power not only as electronic panopticons but also as embedded in the micro-physics of everyday life, power as relational, power and the subject, discipline power and power/knowledge. This is a contribution for those interested in how power prevails in discourse, knowledge and social relations. However, Introna himself (p131) points out that to analyse how information systems become stable in organisations we should look at the circuits of power that sustain the systems. His work is relevant for the reflections about Foucault's works on power and their relation with information systems, as well as his suggestion that the Foucaldian perspective

needs to be complemented if researchers are going to give an account on how information systems become stable, institutionalised, or as Silva and Backhouse (1997) call it: like part of the organisation's furniture.

Emancipation

To seek emancipation is to aim at freeing individuals and groups from repressive social and ideological conditions that hinder human communication (Honderich 1995). In organisations, individuals will achieve emancipation if they can escape power constraints. However, this can only be achieved in ideal speech situations. Fundamentally these are communication acts that are free from power and authority. According to Habermas (1979) an ideal speech situation will require four main conditions. These refer to the work of Austin (1962) and Searle (1969) on speech acts theory[2]. Firstly, the propositional content of the utterance should be truthful. Secondly, the illocutionary force should be valid. Thirdly, the utterance should be expressed sincerely by the speaker. Fourthly, the speaker and hearer should understand each other in a comprehensive way. This ideal situation will eventually allow participants to acknowledge their real interests (Habermas 1972; Habermas 1974; Mumby 1988). Power and authority will interfere with these conditions. In this context power is perceived as distorting communication and therefore as a factor that hinders emancipation.

In the field of information systems, the emancipatory approach has been mainly applied to the process of developing information systems. The point is that by incorporating these ideals in the design and development stages, information systems can be effective instruments for emancipation. This approach has been analysed in depth mainly by Scandinavian researchers (Asplund 1982; Bjorn-Andersen et al. 1982; Cooley 1982; Kyng and Mathiassen 1982; Sorge et al. 1982; Ehn and King 1987a). This school of thought proposes to apply technology not as an instrument of domination by managers but as a way of emancipating workers. In America, Hirschheim and Klein (1994) also have explored the idea of emancipation linked to information systems development. Hirschheim and Klein point out that the Scandinavian experiences of emancipation have consisted principally in transferring control of information systems

[2]For a formal critique on speech acts theory see Grice (1989).

development and design to trade unions. According to Hirschheim and Klein, this transfer of control leads to another type of communication distortion which is introduced by the power structures of trade unions.

Hirschheim and Klein argue that information systems developed by a methodology embracing emancipatory principles could generate an ideal speech situation in organisations. To do so, Hirschheim and Klein suggest some modifications to the ETHICS method[3]. The modifications they propose would provide ETHICS with tools to avoid distortions that might come from authority and illegitimate power, peer opinion, time pressure, resource limitations and social differentiation (e.g. values, beliefs). Thus a modified ETHICS would facilitate the debate on organisational problems and concerns by introducing obligatory critical checks. Participants should have equal opportunities to raise issues and be in a position to accept or refuse orders. Furthermore, participants should be able to question sincerity and to express their feelings and emotions. Hirschheim and Klein suggest that an organisation applying emancipatory methods will increase the creativity and autonomy of their members. Creativity is an essential characteristic, they claim, for an organisation to meet competitive challenges. They also stress that only autonomous and responsible people will take action when things go wrong. To sum up, emancipation will have the effect on organisations of increasing their flexibility and capacity to deal with uncertainty.

Although the emancipation approach presented by Hirschheim and Klein might influence organisations in the way they anticipate, we have some reservations particularly regarding power. Hirschheim and Klein themselves recognise some of the limitations of their emancipatory approach. Unfortunately, ideal speech situations cannot be achieved in practice (Mumby 1988)[4]. An emancipatory method for developing information systems does not consider how to deal with the 'dark side' of power, i.e. vested interests and hidden agendas. The strategic and tactical nature of power or its dark side, as Hirschheim and Klein call it, is irrefutable and pervasive. Furthermore, emancipation ideals lead to what Benton (1981) calls the 'paradox of emancipation'.

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[3]ETHICS is a information systems development method (see for an explanation of socio-technical approach Mumford (1987)).

[4]In a lecture given by Habermas himself for the Aristotelian society in London the 3rd of March 1996; he claimed to hate the term 'ideal speech situation' because it was misleading. He went on to say that he regretted having coined it.

According to emancipation principles, if power is being exercised, those on the receiving end will not realise it. Thus, how is it possible that users can reach self awareness of power exerted over them, if IS professionals or managers are exerting that power? Only when power ceases to be exerted can users realise it, but when this is the case, it is of no use to them at all. Therefore, to be emancipated users need power and knowledge; power and emancipation constitute the two sides of the same coin.

However, the strongest criticism of their ideas might be that they do not consider power relations prevailing within the organisational context. For example, in developing an information system applying their modified version of ETHICS, users still belong to other domains in the organisation. Outside the information system within the organisation, users still belong to other spheres where authority and domination prevail: managers are managers and employees are employees. This is discipline power. The application of ETHICS will be therefore benefited from a political appraisal of the organisation that includes discipline power.

1.2.2 Power over

Lukes (1974) criticises the 'power to' conception because it disregards the relational nature of power that, for him, should involve at least two agencies. The drawback of the 'power to' conception, according to Lukes, is that it ignores conflict. Law classifies Lukes' work as 'power over'. He derives this notion from Lukes' definition of power: "A exercises *power over* B when A affects B in a manner contrary to B's interests" [emphasis added] (Lukes, 1974: 27). Lukes would call 'power over' power, and instead of using the term power he would use the term influence. Lukes' definition raises the question of how to identify B's real interests. The research problem with this definition is that the realisation of interests leads us to moral relativism. Who is going to identify the real interests? Would it be up to an observer or be established by interrogating the participants? This difficulty is illustrated in Mintzberg's (1983) remark qualifying politics as illegitimate power and that of Hirschheim and Klein (1994) deeming politics as the dark side of power. Politics is illegitimate for the former because it stands against managerial interests and for the latter because politics reflect personal interests. Both positions, we

believe, show the problem of moral relativism in Lukes' 'power over' approach. For Barbalet (1987: 8) Lukes' conception of power is sociologically vacuous:

> If to be subject of power is to have ones real interest contravened, and if real interests can be identified only outside a subordination to power, then is impossible ever to determine whether one is subjected to power, except when it ceases to matter.

Lukes' work poses the social science debate between agency and structure. Are our actions determined by our culture, social group, gender or race or do our actions depend on our will? The answer to these questions will divide people into two groups. One includes structuralists and Marxists. In the other group are the voluntarists, and Lukes and Dahl (1957; 1961) belong to this group. Law argues that 'power to' and 'power over' should go together, one represents capacities and the other relations. How these two relate, he claims, is one of the most important questions in sociology. One attempt to solve this debate in sociology is the vast work of Giddens (1968; 1976; 1977; 1979; 1984; 1991). This problem has also been addressed in information systems, mainly by those who focus on the relationship between organisations and information technology. Does information technology determine organisational change or is it the other way around? The works of Orlikowski (Orlikowski and Robey 1991; Orlikowski 1992; Orlikowski 1993) and Walsham (1993b) that will be discussed in a further section and in the next chapter address that question.

'Power over' has been the concern of researchers on information systems throughout the 80s and the 90s. Research throughout the 80s concentrated predominately on the relationship between users and developers of information systems (Keen 1981; Markus 1983; Franz and Robey 1984; Markus and Bjorn-Andersen 1987; Willcocks and Mason 1987) while research in the 90s has been focused mainly on the relationship between consultants and organisations (Yakura 1992; Bloomfield and Coombs 1992; Bloomfield and Best 1992; Bloomfield and Vurdubakis 1994; Bloomfield and Danieli 1995). The rest of this section discusses the orientation and contributions of those studies.

Power in the implementation of information systems

This approach is characterised by the recognition of the technical and political nature of implementing information systems. This political dimension can be

understood as a conflict, either overt or covert, by the different interests of users and systems analysts. It also considers the resistance exerted by users against the implementation of an information system (Keen 1981; Markus 1983; Wynne and Otway 1982; Franz and Robey 1984). The limitation of this type of approach, considering power relations as conflict of interests, leads us to the moral relativism problem pointed out above. This is clearly illustrated in Keen's (1981) work. Keen understands resistance as a behaviour intended to prevent the implementation or use of a particular system. As a consequence this resistance prevents the achievement of the system designer's objectives. In this sense Keen suggests that the only way to differentiate legitimate resistance from genuine sabotage is by reference to the user's conscience.

> Obviously there is a fine line between honest resistance to a project one feels is misguided and selfish sabotages of a necessary innovation. The difference is a matter for conscience and self-scrutiny. In both cases, the response is political, whether "clean" or "dirty" politics (p. 28).

The problem here is how to distinguish between what is "clean" from what is "dirty" without incurring moral relativism.

Both, Keen (1981) and Markus (1983) propose recommendations for systems analysts, including the participation of users in systems analysis, design and implementation (Markus, 1983). Keen recommends a tactical response to overcome resistance, called "countercounterimplementation". This strategic and tactical position consists in creating alliances, providing incentives, promoting the signing of very specific and detailed contracts and in defining clearly the scope and objectives of the project. His approach is similar to that of Willcocks and Mason (1987) whose work might suggest managerial interests as paramount. Knights and Murray (1994: 11-12) criticise this type of approach not only for the aforementioned moral relativism but also by ignoring the construction and the base of organisational politics:

> In promoting the sectional interests of IS specialists, they [those researchers] are blind to the contradictions and tensions of organisational life in market contexts and how these make the 'rational' objectives of any one group difficult to achieve. Their research 'cries out' for a broader analysis of markets, socio-economic power and the political nature of managerial labour. Like technological determinism, then, socio-technical approaches avoid the implications of their recognition that politics is a factor in technological and organisational change. Unless politics can be mobilised in favour of managerial goals, it is viewed as disruptive.

Markus and Bjorn-Andersen's framework of power

We present here the work of Markus and Bjorn-Andersen (1987) who have proposed a framework to look at the relationship between power and information systems. Markus and Bjorn-Andersen (1987) especially focus on the power exerted by information systems professionals over users. Their contribution to the understanding of power relations between these two organisational actors is pragmatic. They argue that a better understanding of the power exercised by information systems professionals over users might have a positive effect on the productivity of both parties. Their conception of power is based on Lukes' (1974) three dimensional model of power. Accordingly, Markus and Bjorn-Andersen see power exercise as behavioural outcomes rather than intentions. To study this power exerted by information systems professionals over users they propose a framework (see Figure 1) that considers the target and the context in which power is exercised.

		Target	
		Facts	**Values**
Context	**Project**	technical	conceptual
	Policy	structural	symbolic

Figure 1 Markus and Bjorn-Andersen Framework

The context where power is exercised can be either over policies or projects. The target can be either factual issues or tangible resources. They distinguish four types of power exercise: technical, structural, conceptual and symbolic. Technical power is exercised when, for example, clerks are forced to use a system they reject. Structural power is exercised when the information system creates or reinforces organisational structures by automating processes that could grant information systems professionals authority or user dependence. Conceptual power is exercised

when systems analysts define or influence the objectives or development methods of a particular information system. For example, the methodology chosen to develop the information system might determine the degree of user participation. Symbolic power is exerted, for instance, when information systems professionals shape users' desires and values outside the context of an individual system development effort. One example of symbolic power presented by Markus and Bjorn-Andersen (1987) is the individualistic patterns of behaviour induced by the use of PCs.

According to Markus and Bjorn-Andersen, awareness of the exercise of power will help users and systems analysts to avoid resistance and manipulations and to negotiate different positions in an overt way. Therefore, power should be understood from two different perspectives: the users and system analysts. The application of this framework, their authors suggest, might facilitate the introduction of technological change in organisations. Moreover, understanding users' power is essential to obtain their participation in developing information systems. Consequently, the analysis and awareness of the different types of power exercised by information systems professionals can boost the productivity of both parties.

Although the framework can be useful for analytical purposes it has been criticised (see Bloomfield and Best, 1992: Bloomfield and Coombs, 1992). Bloomfield et al. criticised the Markus and Bjorn-Andersen framework in two aspects. The first aspect is related to the power definition drawn on by Markus and Bjorn-Andersen to propose their framework:

> Thus, from our perspective, to say that IS professionals have exercised power over users means that the users behaved differently from the way they would have if not for the professionals (Markus and Bjorn-Andersen, 1987: 499).

This definition is similar to that of Lukes' (1974) and therefore it contains the same problems with his conception of power regarding the assumption of 'real interests'. The identification of real interests will depend on an independent observer who will stand in a relative moral position (Clegg, 1989). For example, the socio-technical approach to information systems assumes that the real interests of workers are to improve their working conditions and that their interests can be represented by their elected spokespersons (Mumford and Henshall 1979). The identification of real interests will always be an exercise of power itself (Bloomfield and Best, 1992). The second problem with the framework is that technical facts and user values are not so

easy to differentiate. Not to mention the difficulty to identify users' values; in emphasising particular requirements one group of users, for instance, could argue that their reasons for that emphasis are technical while concealing (intentionally or unintentionally) other interests.

Applying Sociology of Translation: Bloomfield's work

The concept of 'sociology of translation' was developed by the French sociologists Michel Callon and Bruno Latour (Callon 1986; Latour 1986; Callon et al. 1986b; Latour 1987). The sociology of translation attempts to provide a whole picture of power relationships: "Understanding what sociologists generally call power relationships means describing the way in which actors are defined, associated and simultaneously obliged to remain faithful to their alliances" (Callon, 1986 p224). The sociology of translation as a method of social inquiry comprises three methodological principles. The first principle is about the agnosticism of the observer. This principle implies that the observer must avoid to censor and make judgements regarding the subjects under study. The second principle is that of symmetry. This principle consists in describing scientific, social and technological issues in the same terms[5]. The third principle is about free association. This principle implies refusing to accept all a priori differences between social and technological events (Callon, 1986).

Bloomfield and Best (1992) applied the concept of sociology of translation to analyse how organisational problems are defined and how an information technology (IT) solution is proposed by IT consultants. They focused particularly on how power is exercised throughout this process. Because of the centrality of power in social theory, Bloomfield and Best took a sociological inquiry position to approach power exercise regarding organisational information systems. The organisational definition, the proposal of the IT solution and the implementation of the solution are considered by Bloomfield and Best as a process of sociological 'translation'. Furthermore, organisational information systems, they claim, are intimately related with the views about what is technical and what is social. Moreover, this boundary between what is technical and what is social depends on negotiation. Bloomfield and Best draw on the

[5] Callon states that he has chosen the vocabulary of translation terminology (see Callon, 1986).

third principle of the sociology of translation, the principle of free association, to establish their inquiry method:

> We will argue that no a priori boundaries should be drawn between the 'technical' and the 'social' aspects of information systems development and that realisation of this point is central to any understanding of the exercise of power in such contexts."(Bloomfield and Best 1992: 534)

IT consultants exercise power over organisations when they claim to know what is technically possible and what is not. Implicitly they are acting as IT spokespersons and are defining what is technical and what is social. The epistemological position of Bloomfield and Best denies the possibility of grasping 'the objective reality' of the problems, rather they concentrate on the struggles to represent and define problems. To support their argument Bloomfield and Best present the cases of two information systems analysed by applying the sociology of translation. One is the relationship between IT consultants and managers of organisations and the other is the case of an information system within the NHS.

The first example concerns the power relations between IT consultants and their counterparts in organisations, particularly how the former use the managerial discourse to influence the latter. One of the resources IT consultants draw on to claim their representation of technology and to define themselves as obligatory passage points is the managerial discourse. The managerial discourse postulates that IT can boost organisational efforts aimed to increase efficiency and to provide organisations with a competitive edge. Consultants along with their regular IT services, offer to help organisations to define their long term goals and to understand their particular culture. Without this whole view, consultants claim, IT applications will be developed in an ad-hoc manner. Organisations therefore face two problems. One is how to incorporate IT into plans and programs aimed to achieve goals in the long term. And the other problem is how to co-ordinate the development of computer based information systems and the investment of IT related services. IT consultants propose as a solution for both problems the formulation of what they call: an IT strategy (Bloomfield and Best, 1992; Bloomfield and Danieli, 1995). For example, if organisations want to buy a new software package, consultants will pose as objective advisors (Bloomfield and Danieli, 1995).

The second example presented by Bloomfield and Best is related to an information system to produce discharge summary letters (DSL) in the NHS. This case study concentrates on the struggles between IT consultants and their counterparts in the NHS for the definition of this information system, particularly on deciding what was technical and what was not. Eventually, IT consultants convinced their counterparts that the information system could not produce "free text" letters, because physicians have not standardised the way DSLs should be produced. These examples presented by Bloomfield and Best suggest that the definition of an organisational problem and the proposal of its IT solution are both exercises of power.

In another piece of research Bloomfield and Danieli (1995) present the case study of hospital information systems. In this study the authors also applied sociology of translation to analyse power exercise between IT consultants and their counterparts in the NHS. Bloomfield and Danieli show how the IT consultants drew on technical explanations to persuade their counterparts to drop some of their demands about the system. One of the most important IT resources during these struggles was the alliance with the technical expert in the hospital. This alliance allowed the IT consultants to legitimise their claims about the 'technical' nature of the impediments to incorporate users' demands in the system. To sum up, the argument of Bloomfield and Danieli is that the technical component of computerised information systems can only be reached through mediators, i.e. spokespersons. The mediation can only be achieved after a socio-political exertion of power. These insights highlight the relevance to incorporate a sound theory to research power exercise related to information systems.

The work of Yakura (1992) has also focused on the power relations between IT consultants and organisations. She concentrated on the symbolic power exercised by the consultants over their customers. Her results coincide with those of Bloomfield and colleagues. She found that the ambiguity of information technology, the blurred boundaries between what is technical and social, for example, favour the consultants as they are able to generate and manipulate meanings to legitimate their proposals and offerings. Although she does not tell us how the power exercised by IT consultants over their customers becomes stable, her work is relevant for our purposes, not only for her concern on ‘power over’ but for her application of a sociological theory for the understanding of power relations, that of Bourdieu (1991).

Research on ‘power over’ highlights the relationships among different organisational actors involved with information systems and information technology, namely developers, users, IT consultants and managers. Furthermore, researchers concerned with this type of power have applied sociological theories and interpretive research methodologies to conduct their studies. These works do not provide either an empirical or a theoretical account of how information systems become permanent. However, they show both the viability of sociological approaches to the study of power regarding organisations and information technology and that distinguishing the social from the technical aspects of information systems might be itself a matter of power.

1.2.3 Power storage

Law (1991) suggests that both ‘power over’ and ‘power to’ can be stored. In studying power, he points out, researchers need to address the question whether power can be stored or not. This question is answered negatively by Foucault (1977) who argues that power is only an end product that should not be reified; this view is also shared by Latour (1986). However, useful as this assertion may be -in the sense that we should study power because it prevails wherever and it is only recognised in actions- it does not help for analytical purposes. Our day to day experience teaches us, for instance, that some people can be and are effectively more powerful than others and Foucault’s power notion does not account for that. For example, Foucault’s (1977) conception of power does not tell why the discipline inscribed in an army has different manifestations in a soldier than in a general. Law (1991) claims that his notion of ‘power storage’ accounts for that phenomenon. The reason the general is more powerful, i.e. has more power than the soldier, is the result of the bureaucratic and authority relations (in terms of punishment and rewards) that have been institutionalised in the army. Law (1991: 170) makes his claim of the plausibility of ‘power storage’ very clearly:

> ...as lay people we work routinely on the assumption that both ‘power over’ and ‘power to’ can indeed be stored, even if the methods by which they are stored are never entirely secure and we know our store may spring a leak. If this were not the case we would never open bank accounts, we would never accept promises at face value, and neither would we say (surely with some reason, at least most of the time!) that Prime Ministers have “more power” than back-benchers.

Thus a theoretical framework of power should account for the conditions and factors that make the position of an agent more or less powerful than that of others. The rest of this section concentrates on those studies on information systems that have adopted the 'power storage' perspective.

The concern of researchers over 'power storage' can be seen in the applications of resource dependency (Pfeffer and Salancik 1978; Pfeffer 1981) and contingency theories (Hickson et al. 1971; Hinings et al. 1974). Resource dependency theorists see organisational members not as completely autonomous but interdependent. To act, those members need resources such as money, personnel, technology and information, and to obtain those resources organisational members need to interact and negotiate with those who control them. In this context, the control and possession of resources is a source of power[6]. Contingency theory, on the other hand, addresses organisational phenomena such as power, decision making and change in organisations. This theory explains how it is that particular organisational units can exercise more power than others. For contingency theorists, 'power storage' of organisational units lies in the distinctiveness of their sources of knowledge and skills, their centrality -how the units are related to the rest of the organisation- as well as on how easily the units can be replaced. Both theories, resource dependency and contingency, have been applied to the study of power relations between information systems units and organisations (Lucas 1984; Saunders and Scamell 1986; Goodhue et al. 1988; Clemons and Row 1992; Gupta et al. 1994; Cavaye and Christiansen 1995; Reekers 1995; Cavaye and Christiansen 1996).

The 'power storage' perspective along with resource dependency and contingency theories have led researchers to suggest information systems units within organisations as powerful. This type of research was more popular in the 80s than in the 90s. In the 80s, information systems units were thought to be powerful since they 'possessed' much information, very specialised knowledge, and were very difficult to

[6]Beniger (1986) has looked at the relationship among information, power and control, that is a relationship between 'power over' and 'power storage', where the former depends on the latter. For Beniger control is characterised by two main activities: information processing and reciprocal communication. Information processing is crucial for any purposeful action because it gives an assessment of the current state of affairs where the actions will be carried out. Communication is decisive not only because it is an instrument for transmitting the desired goals but also for receiving feedback. Hence, it is impossible for one agent to exercise power over another without information. An implication of Beniger's ideas is that the control exerted by any party in power relations will depend on the quality and quantity of information.

replace (Lucas 1984; Saunders and Scamell 1986). The studies conducted by Lucas (1984) and Saunders & Scamell (1986) applied the strategic contingency and resource dependency theory to analyse the power relations between information systems units and the rest of the organisation. Lucas (1984) suggests that information systems units might be considered powerful for three reasons: (1) computer based information systems have created organisational uncertainty that can be only reduced by the information services units; (2) poor systems documentation also makes it difficult to substitute their advice. (3) Because of the above, Lucas supposes that information services departments may be highly connected to other departments.

The results of these studies showed, nevertheless, that information systems services were not considered as powerful as they might have been expected. Lucas suggests that this might be because the information services units are not involved in any key decision-making processes. This conclusion seems to be a tautology, because if the information systems staff were involved in key decisions they already might be regarded as powerful: the cause of power is the effect of power. Lucas' research showed also that, despite seeming powerful, information systems units were not involved in a higher level of decision making. This observation points out that somehow the information systems units were unable to store power. This thesis proposes a theoretical framework and presents empirical data that highlights the factors that allow information systems units to store power.

Recent research has applied contingency theory for understanding the political factors affecting the implementation of information systems (Cavaye and Christiansen 1995, 1996). They argue, by drawing on contingency theory, that information systems can change the distribution of power ('power storage') among units within organisations because information systems affect access to and control over information. Accordingly, those units perceiving that they would lose power by adopting an information system would resist its introduction. Cavaye and Christiansen (1996) illustrate their contingency based framework by applying it to a case study. Although they claim their contribution consists in mapping the power of the organisational units, we believe their main contribution is in pointing out the limitations of the contingency approach. On the one hand, they acknowledge that their framework neither contemplates other types of power nor provides an account of the

influence of the organisational environment on ‘power storage’. On the other, they recognise that contingency theory, by concentrating on organisational units, overlooks the power exercised and held by individual actors.

Clegg (1989: 190) criticises theories that consider resources as a source of power because they are in some respects tautological:

> How is power to be recognised independently of resource dependency? Resource dependency of X upon Y is the function of Y’s power. Equally, Y’s independence is the function of X’s dependence upon Y, given the previous X-Y relationship. The cause of power is resource dependency. At the same time, the consequence of resource dependency is equivalent to its cause. Hence notions of cause and consequence are meaningless in such formulae. *Part of the problem is the pervasive tendency to think of power as a thing without considering that it must also be a property of relations* [emphasis added].

The limitations of both theories, resource dependence and contingency, suggest that a complete approach to power requires the consideration of the other types of power. We will show in Chapter Three that is possible to integrate the study of different types of power in one theoretical framework, the circuits of power.

1.2.4 Power discretion

Once power is ‘stored’, in the sense of enjoying privileged standing conditions as that of the general in an army and if the general or empowered agent has options in his or her scope of actions then this will imply discretion. ‘Power discretion’ will be the different options that agents have in hand to deploy the power that is stored. In other words, power discretion, to paraphrase Law (1991: 170), is the capacity of an agent to switch on or off ‘power to’ or ‘power over’. Law gives the example of a bank manager who has different options where to invest money. The manager decides either to lend money or not to a particular organisation or country, that Law claims is ‘power discretion’. Sociologists that embrace this approach are (Parsons 1937; Parsons 1967; Alexander 1983).

Law draws on Barnes (1988: 58) to support his point that power is not only the capacity of action but discretion as well. Discretion here is understood as the faculty held by an agent either to act or not, or to choose among different ways of action. Those who do not have discretion are called authorities by Barnes. Authorities are like relays because power only circulates through them. Those who have discretion are, called ‘powers’ by Barnes. ‘Powers’ exercise discretion through calculation and

choice. However, agents can be ‘powers’ and ‘authorities’ at the same time. The distinction will depend on the position they occupy in the network of relations. Law (1991: 172) warns us against considering ‘powers’ and ‘authorities’ as dichotomies, suggesting that we consider them as continua, and also calls for looking at the conditions that make power relations stable.

> I want to talk of power to and power over, of the way in which these are stored up and deployed. But at the same time I do not want to lose sight of the way in which these are also a set of precarious relational and transformational effects. Accordingly, for me the crucial research question has to do with *how it is that relations are stabilised for long enough to generate the effects, and so the conditions of power*. Or, indeed, what ‘for long enough’ might mean.

Research on information systems influenced by the ‘power discretion’ approach has concentrated on the relationship between decision making and power, i.e. the political nature of decision making (Pettigrew 1972; Pettigrew 1973; Wynne and Otway 1982; Wilkinson 1983; Davenport et al. 1992; Scarbrough and Corbett 1992; Noble 1995). Knights and Murray (1994: 2) classified this type of research as processual as its focus is localised politics and implies that the exercise of power might be disruptive. The ‘power discretion’ approach to the study of information systems particularly that of Pettigrew (1972 and 1973), on the one hand, conceives organisations as political arenas where units and members dispute the control of resources. On the other, it assumes that the main motivation of organisational actors is career and self-development. Thus, to re-take Law’s notion of ‘power discretion’ we could say that the calculations made by agents when they exercise discretion are highly influenced by career advancement and self-development (Pettigrew 1972; Pettigrew 1973).

Pettigrew (1972) shows how particular organisational agents that control the flow of information -the gatekeepers- can influence the outcome of decisions. Pettigrew illustrates his point by showing in his case study how a gatekeeper influenced the acquisition of specialised equipment to boost his power position. Pettigrew’s research also points out how information and knowledge can be equated with power, i.e. power storage. Furthermore, his work suggests that discretion needs to be disciplined if organisations are going to subordinate individual interests to more general objectives. It is because of these insights that Pettigrew’s work remains as a classic in the study of politics and information. What this thesis aims to achieve is to

integrate his contributions with those of others discussed so far in a systematised theoretical framework.

While Pettigrew highlighted that political decisions are often led by calculations based on self advancement, other work (Wilkinson 1983; Scarbrough and Corbett 1992; Scarbrough 1993) addresses power relations not only between individual agents but also between groups, namely managers and workers. Wilkinson (1983) suggests that IT is mainly adopted by managerial choice influenced and legitimised by the efficiency discourse. Scarbrough and Corbett (1992) emphasise that managers make decisions regarding technological innovations based on their knowledge about organisations and technology. They coincide with Wilkinson in highlighting that the predominant discourse in making decisions about technology are Fordist notions of control. Furthermore, Wilkinson, Scarbrough and Corbett recognise that workers can influence decisions on the acquisition, design and use of IT, but for this to occur is necessary that workers are conscious of their interests and with a well-established identity. This is shown by Ehn's research and that on the UTOPIA project (Bjerknes et al. 1987; Bodker et al. 1987; Ehn and King 1987a; Ehn 1991).

The work of Pettigrew, based on the politics of individual decision making, contrasts with that of Wilkinson and Scarbrough who focuses on managers and workers. Nevertheless, what they have in common is that they link decision making to discourse or knowledge, self advance in the case of Pettigrew and efficiency and Fordist controls in that of Wilkinson and Scarbrough. Another common characteristic is that both approaches draw theoretical implications from European case studies. Given the common location an interesting question would be: Are the theoretical implications only applicable to the European context or can they be applied in another context? A positive answer would strengthen a theory of politics, power and information systems, while a negative one would open more avenues for further research. As mentioned above it is one of the purposes of this thesis to address that question.

1.3 Summary and Final Remarks on Research of Power and Politics in Information Systems

Law's (1991) study has allowed us to identify four different notions of power: power as a capability ('power to'), power as relational ('power over'), power as standing conditions ('power storage') and power as decisions ('power discretion'). The typology of power formulated by Law has also helped us to classify the current literature on power and information systems, and to trace the intellectual origins of the ideas underpinning that research. We have also seen how particular approaches to power and information systems have contributed to our understanding of different aspects of the political dimension of information technology applications in organisations (see Table 1). Some studies point out the enabling, constraining, or emancipatory features of information systems while others suggest the conflicting relations and political dimensions of decision making.

We have discussed already the particularities, contributions and limitations of the studies cited in Table 1. Now we will reflect on three general issues derived from those works. Let us start by recognising that there is a common characteristic in most of those studies: they focus on a narrow area of power. This restricts the understanding of power relations by applying the theories proposed and endorsed in those studies. Conversely, if a theory of power were to integrate consistently different approaches it would help researchers to make more sense of power relations. An integral theoretical framework, then, should encompass coherently the contributions to the study of power provided by social and political sciences. This has been done in the field of information systems. Scholars such as Knights and Murray (1994) and Coombs et al. (1992) have offered integral frameworks that include the study of the power and political aspects of information systems in organisations. The former concentrated on the politics involved in the development, deployment and use of information technology while the latter focused on its organisational impact. These two frameworks, however, do not have as their purpose to make sense, in terms of power, of how information systems become institutionalised and fixed in organisational life.

Secondly, the explanatory[7] force of a framework of power might be tested, for example, by asking it to account for phenomena occurring in different cultural and organisational contexts. Most of the empirical studies cited in this chapter have been conducted in the Northern hemisphere, either in the USA or in Northern Europe. We pointed out some of the contributions of those studies. It would be interesting, though, to conduct research in different cultural and national contexts. For example, contrary to the proposals of academics embracing the 'power over' approach, some studies in developing countries show that neither participatory design or symbolic power are *sine qua non* requirements for the adoption and institutionalisation of information systems (see for example, Montealegre 1994). What seems to be the key for adoption and institutionalisation is the presence of an individual championing the system (Ibid.). Thus for the purposes of our research, we may ask: is there a framework of power that could account for those apparently disparate conditions for institutionalisation? The following chapters aim at answering this question.

The third and final observation also refers to the strength of a framework of power. In the context of our research, a strong framework should account not only for how a system becomes stable but also how it is either rejected or abandoned. A framework able to do that could span its scope of application to understand what some scholars regard as failure of information systems, particularly when among the reasons of failure are political and power factors.

With this study we intend to help other researchers in their task of developing intellectual tools for the study of power. However, our research does not pretend to reduce the understanding of information systems phenomena to power, politics and institutionalisation. What we are aiming at is to understand how organisational power and politics interplay with the institutionalisation of information systems. That is the main purpose of this thesis. The structure of the dissertation is introduced in the following section.

Table 1 Summary, Research on power, politics and information systems

Type of Power	Features	Origins	IS Researchers	Contributions

[7] In this dissertation we do not use the term explanation to imply cause and effect between factors and variables, rather we use it to denote making sense of phenomena.

Power to	Enabling, productive and emancipatory.	Foucault and Habermas.	Mumford, Hirschheim & Klein, Zuboff, and Sewell and Wilkinson.	IS are instrumental either for achieving productive goals or for emancipation.
Power over	Relational, influential and dominant.	Lukes, Dahl.	Keen, Markus, Bjorn-Andersen, Franz, Robey, Willcocks, Yakura and Bloomfield.	IS professionals (system developers and consultants) exert power over users, customers and organisations.
Power storage	Dependent on resources, regulatory norms and rules.	Pfeffer, Hickson et. al., Hinings et. al.	Cavaye, Christiansen, Lucas, Saunders and Scammel.	Control over information and IS is a source of power.
Power discretion	Discretionary and intentional.	Parsons and Barnes	Pettigrew, Wilkinson and Scarbrough.	Those who made decisions regarding IS and the acquisition and use of IT exercise power; they make decisions either as rational actors or within a discourse.

1.4 Organisation of the Dissertation

This dissertation is divided into seven chapters. This chapter introduces the research topic, discusses and analyses the current literature on power and information systems while Chapter Two concerns the research design. In Chapter Two we argue for our choice of the interpretive approach, reflect on theoretical frameworks that have the study of power as one of their components and present the adopted research methods and techniques. The third chapter introduces our theoretical stance for the study of power in the adoption and institutionalisation of information systems: the circuits of power framework. We present the main elements of such a framework, its notion of organisation and agency as well as the three circuits of power: episodic and those of social and system integration. Furthermore, this chapter presents the application and testing of the circuits framework on one secondary case study; the collapse of the London Ambulance Service computerised information system in 1992.

Chapters Four, Five and Six are dedicated to our main case study: the adoption and institutionalisation of three information systems in a research centre in Latin America. For both tasks, collection and analysis of data, we applied the circuits framework. Thus, Chapter Four outlines the national and international contexts of the organisation in question. However, it is the circuit of social integration -of the information systems under study- that constitute the core of this chapter. The circuit of system integration is the focus of Chapter Five, while Chapter Six centres on the episodic circuit. Each one of these three chapters (i.e. Four, Five and Six) has two

functions which are to present the collected data and to discuss the data in the light of the circuits framework. The last chapter, Chapter Seven, summarises the research findings and highlights the key theoretical, methodological and practical implications as well as the contributions of the dissertation. We conclude by addressing the limitations of the study and suggesting avenues for further research.

Chapter Two

Research Methodology

The purpose of this chapter is to present the philosophical assumptions underpinning our research, as well as to introduce the research strategy and the techniques applied for carrying it out. We also reflect on the rationale of our decisions regarding the research strategy and techniques. The relevance of this chapter consists in defining the scope and limitations of our design from the research point of view and exploring the different alternatives to each of our choices. The chapter is also useful for classifying our research amongst the different research traditions in information systems.

Our philosophical assumptions for conducting this research come from the interpretive tradition. This implies a subjective epistemology and the ontological belief that reality is socially constructed. The research strategy adopted was to conduct a single embedded in-depth case study in an organisation. Field work was conducted in the site at the end of 1995 and beginning of 1996 and since then a very frequent correspondence has been kept with our informants in the site. The research techniques utilised are those associated traditionally with interpretive research in information systems: semi-structured interviews, observations and analysis of documents.

This chapter is divided into three main sections. The first looks at interpretive research especially in the field of information systems. We have focused mainly on those interpretive research proposals that consider power and institutionalisation. In doing so, we introduce hermeneutics, critical theory and structuration theory as interpretive proposals. At the end of this section we present a summary of their

insights emphasising those on power and institutionalisation. Section two concentrates on our research strategy. It contains our understanding of a single embedded in-depth case study and introduces the reasons for the selection of the organisation. Finally, section three covers research techniques and research sub-units, and a brief summary of our expectations of the theoretical framework we adopted which will be fully developed in the next chapter.

2.1 Interpretivism and Information Systems Research[8]

Interpretivism is an approach to inquiry in social sciences which is grounded in classical hermeneutics and phenomenology. Hermeneutics concentrates on the problem of interpreting texts and experiences from other cultures and from different historical periods. The alternative proposed by hermeneutics to solve this problem is to construct the meaning from the "pieces" of text available to construct what is called an evolving whole. The evolving whole is the starting point for understanding the parts. This process is known as the hermeneutic circle. Interpretivists claim that the social phenomena must be understood in their own social context which itself is constructed and reproduced through its own activities. In other words, the understanding of social action must include the meaning that social agents give to their deeds. Interpretivism then is opposed to the natural science methods of inquiry that assume that the world is ordered by immutable laws. The interpretive research approach is an alternative to natural sciences research because the latter presupposes that social and cultural life is governed by laws external to social agents. Natural sciences try to explain phenomena whereas interpretivism attempts to understand human action through making sense of the meanings underpinning those actions. Furthermore, interpretivism considers that social reality is constructed as the result of intentional actions (Burrell and Morgan, 1979). Interpretivism then is an alternative approach for doing research in the social sciences:

[8]To see a detailed account on the evolution of epistemology approaches to information systems see Hirschheim (1985).

> However, for interpretivists, social reality is the product of its inhabitants; it is a world which is already interpreted by the meanings which participants produce and reproduce as a necessary part of their everyday activities together. Hence, because of this fundamental difference in the subject matters of the natural and social sciences, different methods are required (Blaikie, 1993: 48)

The interpretivist ontology assumes that social reality is constructed through the negotiated meanings that actors give to their actions and situations. The epistemology of interpretivism considers that knowledge is the result of everyday concepts and meanings. Hence it implies that social actions should be accounted for by the same social actors. Researchers undertaking their work with an interpretive approach will go to the social world to grasp everyday meanings and concepts and then they will try to reconstruct these in the language of their scientific discipline.

One of the problems with an interpretive approach is how to grasp meanings. On the one hand the grasping of meaning in a particular situation presupposes that the research has *a priori* theoretical characterisation of those meanings, which itself is arbitrary. On the other hand, interpretivist epistemology takes the actor's account of their actions as irreducible. Thus, interpretive research tends to consider actors' referrals of their actions as the way to obtain knowledge about social reality, and language itself might not be enough to reflect the complex social reality. This approach to actions, then, tends to disregard social structures (Rex 1974). These, according to Giddens (1984), exist in the mind and are an essential prerequisite for the existence of social life, since actors draw on structures to carry out their actions. Giddens also criticises interpretivist assumption regarding the intentionality of actions because it implies reflection and reasoning. He claims that some actions are carried out without reflection, as if they were routine and, that often reflection comes after the action has been carried out. Therefore a richer interpretive approach should include not only the study of socially constructed meanings, but also the structures and actions that bring these meanings into being. Below we discuss how Walsham and Orlikowski have incorporated Giddens' insights into interpretive research in information systems.

Despite its subjective nature interpretivism arises for a very pragmatic reason: the consideration of information systems as socio-technical systems and after the recognition that most of the failures in information systems are the result of social factors (Lyytinen and Hirschheim, 1987). From the mid 1980s to the 1990s we could

say that there was a debate about which research approach should be adopted for undertaking information systems research[9]. Although this debate may be still going on, few would argue against the idea that information systems have a social dimension (see Lee et al. 1997).

We think of information systems as socio-technical because they affect the way people communicate and perform their work. If we accept this premise, that information systems are part social, then interpretivism ought to be a suitable research approach to study their relation with organisations. This is because interpretivism accounts for how social reality is constructed through assigning meanings to actions[10]. Likewise, the elusive essence of power and politics, as discussed in Chapter One, seems to be grasped more thoroughly by interpretivist approaches than by other research positions. Thus, in this dissertation we assume that social reality and the knowledge one can obtain of it are constructed through the interpretations that social agents give to their day to day actions (Berger and Luckman 1967). This assumption guided the selection of our research methodology.

However, the main reason we adopt an interpretive approach in this thesis is because of our conception of power, organisations, information systems and institutions. We presuppose that power is relational and can only be recognised in outcomes. Power can be studied from different points of view, nevertheless as we discussed in Chapter One, it is a relation of forces with a strategic nature that involves decision making and depends on standing conditions. Because of that notion we believe that power relations can only be understood by reconstructing the context in which they exist and by discovering the meanings agents assign to their actions. We conceive of organisations as cultures and political arenas wherein social reality is

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[9]For more on this debate see: Galliers (1987), Galliers (1988) and Jarvenpaa (1988), Baneville (1992), Klein and Lyytinen (1985). To see detailed account of interpretive research modalities in the field of information systems see Walsham (1993). Boland (1985 and 1991) for example has advocated using hermeneutic or phenomenological approaches; Andersen (1991), Stamper (1985, 1988 and 1991) and Liebenau and Backhouse (1990) have advocated the application of semiotics as an analytical tool for understanding of information systems. Kuuti (1991) and Bodker (1991) suggest activity theory as a foundation for information systems research. Lyytinen and Klein (1985) propose critical theory as a way to account for different types of human actions while Ngwenyama (1991) analyses some of the concepts and limitations of this theory in relation to information systems research. For a very recent account of qualitative research and interpretivisim see the works in Lee et al. eds. (1997).

[10]Klein and Lyytinen (1985) show the paradigmatic problems and limitations of hard science research approaches to information systems

constructed by their members continuously relating to institutions. It is the way we believe the world is constructed and how we can learn from it that influenced us in selecting an interpretive approach to our research.

Interpretivist research has been applied in the field of information systems along several theories. In the following sub-sections we discuss three of those theories: hermeneutics, critical theory and structuration theory. Those three were selected because they have power as one of their components. We have concentrated on their components and their contributions. This is relevant in the context of this dissertation, because our research aims at adapting an already existent theoretical framework to the study of power, politics and information systems. By discussing these three theoretical stances we will observe that none of them concentrates fully on power. This suggests the need for exploring other frameworks that would account comprehensively for the phenomena that is in the centre of our study.

2.1.1 Hermeneutics and Critical Theory

Boland (1985, 1991) has argued in favour of an interpretive approach to information systems through hermeneutics. As was discussed above (see footnote 8) the interpretive tradition of research in social sciences derives from phenomenology and hermeneutics. A phenomenological approach is suggested by Boland (1985: 193) because information systems exist in organisations that, according to him, are socially constructed through language and acts of communication and because "information systems are data becoming information in consciousness." Boland relates phenomenology, hermeneutics and research on information systems by proposing that information systems should be considered as texts that need to be interpreted[11]. This stems from Boland's assumption that organisations and information systems are constituted by communication acts and therefore research is an interpretive task. Boland argues that the output of an information system does not represent an

[11]Phenomenology is the systematic study of consciousness in order to understand the essence of experience. Boland equates consciousness with the search of meanings. So phenomenology concerns the study of meanings that give sense to our day to day experience. Hence the hermeneutic problem which is the interpretation of text is a phenomenological problem. Boland (1985) proposes a definition of phenomenology as the intuition of essences. Husserl (1931) claims that one can only know phenomena, but by reducing phenomena one can achieve objectivity.

objective truth but it represents objective reality and therefore it must be interpreted by users:

> ...the output of an information system is an unfamiliar text to be read, interpreted and made meaningful by those who use it in ways that will always surpass any clear representation the system's creators had in mind...Studying that process of interpretation is the hermeneutic task for information systems research. p440

Thus, Boland suggests that the contribution of an interpretive approach to research in information systems consists in the relationship between their output and organisations. The interpretive approach will help researchers, then, in understanding the way users make the outputs of information systems meaningful and how the outputs are incorporated in actions and decisions. In this sense, phenomenology and hermeneutics offer a description and help us to understand the interpretive structures regarding information systems. In our research a phenomenological and hermeneutic approach is taken when we focus on how members of the organisation interpreted the information systems and their outcomes, and when managers and systems analysts attempted to shape those interpretations.

Within the interpretive approach to information systems some authors have proposed critical theory as an alternative for guiding researchers. The purpose of critical theory is to reveal the underlying reality of phenomena[12]. Its epistemology is a mixture of psychoanalysis with Marxism aiming to emancipate human beings from values of control and efficiency especially from those discourses based on technology (Johnson, 1995). One of the main exponents of critical theory is the German philosopher Jurgen Habermas. Habermas (1972) argues that science has inscribed interests of technological domination that are covered by the appearance of being free from value judgement. Habermas proposes a framework to be the ground for a critical scientific research methodology. He outlines the three main knowledge interests that drive human inquiry: technical, practical and emancipatory. Each type of knowledge is a frame of reference with which researchers make sense of the world. Critical theoreticians are interested mainly in how actors construct their social world and assign meaning to it. Researchers following this tradition focus also on structures -

[12]Critical theory is associated with the Frankfurt School, a group of German thinkers. The most relevant are: Adorno, Fromm, Habermas, Horkheimer, Marcuse and Felix Weil. It was founded in the 1920s by Max Horkheimer (Johnson, 1995).

either organisational or physical-, social relations and communication acts and the actors' interpretations to these[13]. Their method of inquiry then should map and interpret the meaning of actions within the universe that is under scrutiny. In order to understand actions and to map the context, an active participation and observation of the universe of inquiry are required.

In the field of information systems Lyytinen and Klein (1985) argue in favour of critical theory as plausible for doing research in information systems. They propose critical theory as an alternative to the hard science approach, particularly for research on how information systems are used. They argue that information systems should be designed not only to increase efficiency in organisations but "must also increase human understanding and emancipate people from undesirable social and physical constraints, distorted communication and misapplied power (Ibid.: 219)." The thrust of the argument is in recognising the social aspects of information systems and therefore the inappropriateness of doing research with engineering approaches. According to Lyytinen and Klein the contribution of critical theory to information systems is twofold: classifying existing research and providing a broader approach to information systems, taking into account social aspects such as user resistance, alienation, uncontrolled development and lack of use.

Lyytinen and Klein's arguments in favour of critical theory as an alternative approach to information systems can be summarised in four points: (1) the ontology of information systems research; (2) the epistemology of information systems research; (3) research methods in information systems and (4) the ethics of information systems research. The first argument claims that information systems do not constitute an objective reality but are formed by knowledge rules, and therefore conditioned by their own social history. The epistemological argument states that theories cannot be accepted or rejected only on the basis of their empirical testings or by demonstrating their non-falsification. The acceptance of a theory will be determined by sound reasons and interpretations. The epistemology of critical theory does not deny the plausibility of empirical methods, however it stands against the positivistic claim of an objective truth and exclusive validity in social life. The third

[13]Ngwenyama (1991) within the context of information systems and organisations calls these elements process and structure respectively.

argument suggests critical theory as a meta-theory for the selection of a research method, since critical theory in itself does not tell us how to do research. Before adopting any type of research method, researchers should reflect on what interests are inscribed in their method. The final argument, the ethical one, presents emancipation as the objective of knowledge. In this point Lyytinen and Klein are emphatic:

> The purpose of information systems research is not to inform fellow researchers of 'Universal' laws. But it can help systems analysts and users to inform and help themselves. This means that the ethics of information systems research should be able to deal with such issues and avoid the conservatism which is implicit in current research methods. p230-231.

The contribution of critical theory to research in information systems and power is in unravelling ideology and thus providing theoretical grounds for understanding the relationship between information technology and emancipation. However, this contribution is not free from moral relativism -as said in the previous chapter- because it presupposes the *a priori* ascription of interests by the researcher.

If we might perceive the moral stances of critical theory as one of its drawbacks, Ngwenyama (1991) sees it as one of its strengths. Ngwenyama proposes a more systematic application of critical theory to information systems research. He considers that the application of critical theory has been neglected by researchers of information systems perhaps because of its different language and radically different position. One of the differences between critical theory and traditional social theories is the researcher's attitude towards the object of study. Traditional research does not challenge the status quo, and by avoiding moral judgement it contributes to the support of the status quo, whereas critical theory looks for alternatives that lead to emancipation. "Critical social theory rejects the separation of value and inquiry, knowledge and action, and challenges the unity of the scientific method with regard to social affairs." p497. The four assumptions of critical theory are summarised by Ngwenyama: (1) people have the power to change their world; (2) knowledge of the social world is value laden; (3) reason and critique are inseparable and (4) theory and practice must be interconnected. Ngwenyama's framework for IS research formulates the integration of the three interests and advocates the adoption of action research methodology.

However, alongside the insights researchers can obtain from critical theory there are some criticisms. Lyytinen and Klein (1985) recognise the problems of

critical theory such as how can we know if individuals want to be emancipated and how to distinguish genuine consensus and ideal speech situations[14]. They also recognise the need for more development of this theory towards making it more applicable to information systems. Moreover, Bernstein (1976) suggests inadequacies in Habermas' separation of different interests of knowledge. Although he cannot deny the pervasive influence of technological interests in shaping research in analytical-empirical traditions this does not show categorically that technological interests are determinant.

Despite the discrepancies we believe that the contributions of critical theory to the study of information systems and the political process which leads to their institutionalisation consist, on the one hand, in directing our attention to communication processes and how they can be distorted by the exercise of power. On the other hand, critical theory also highlights how technology can be used either as an instrument of domination or emancipation.

2.1.2 Structuration Theory

Structuration theory is a proposal made by Giddens for solving the social science dilemma between deterministic and voluntaristic approaches of human actions. He formulates it as an ontology of social life and argues that it is misleading to separate social structures from agency because they exist in relation to each other (Giddens, 1984). Giddens (1979) proposes structuration theory to incorporate three main notions of the interpretive approach to research in social sciences: the need to classify actions *vis a vis* intentions, reasons and motives; to associate the analysis of social actions along with the analysis of institutions; the need to include a logic for the scientific method.

Two main ideas underpin structuration theory. The duality of structure and the supposition that human agents are knowledgeable and capable of reflecting on and monitoring their own situations. The duality of structure considers social structures as constituted by human agency and yet at the same time they are the medium of this constitution. For example, the game of chess cannot exist without the rules of chess

[14] See footnote No. 4

and the structured relationships amongst players. However, the reality of chess, as a game, comes into being only when agents actually play it. The game of chess as constructed reality is constituted by agents drawing on shared rules regarding the game. Each time the game of chess is played it is recreated as social reality. On the other hand, chess players are reflecting on their situation within the game drawing on the rules of the game as resources to modify their situation. This example only serves for analytical purposes because, in social life, rules, roles and scope of actions are not clearly defined. Conversely, in a game of chess the players come to the board with the rules already provided externally, with the pieces already distinguished one from another and with the boundaries of the board perfectly defined. In any case when ambiguity arises there is a referee in charge to resolve it.

The duality of structure contains three analytical dimensions (Giddens, 1984). The uppermost dimension corresponds to social structure and the bottommost corresponds to human interaction, both dimensions are linked by modalities, i.e. the third dimension (see Figure 2). There are three structures: signification, domination and legitimation. These correspond to the three elements of human interaction: communication, power and sanction. An interpretive scheme links the structure of signification with communication acts. Structures of domination are constituted and reproduced by agents using resources to exercise power. The third modality, norms, refer to human agents legitimating or sanctioning their actions according to shared norms.

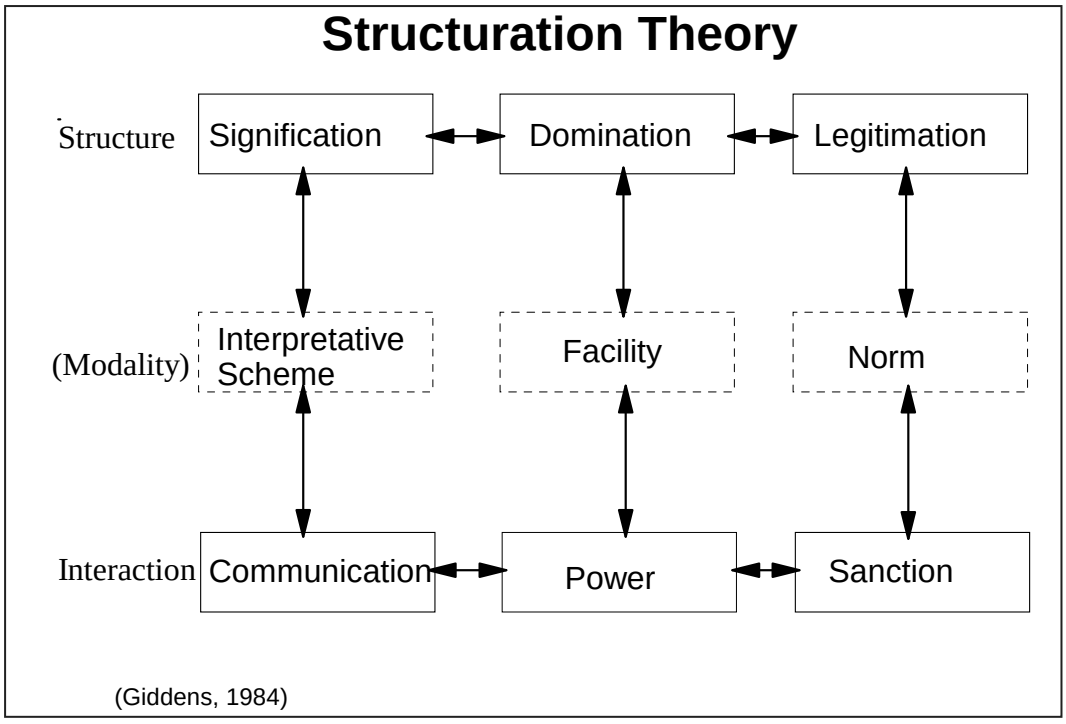

Figure 2 Giddens' (1984) Structuration Model

Giddens (1984) proposes a program for research on social sciences. The study of social practices ordered across space and time should occur at four levels: (1) hermeneutic elucidation of frames of meaning; (2) investigation of context and form of practical consciousness; (3) identification of bounds of knowledgeability and (4) the specification of institutional order. The first level concerns different frames of meaning bestowed upon actions. The second calls attention to different levels of consciousness regarding actions. The third level focus on intended consequences of actions and the fourth deals with the conditions of social systems and systems integration through the identification of the main institutional components of social systems or organisations.

Structuration theory has drawn criticism from several social scientists. For example, Clegg (1979) criticises structuration theory for underestimating the prior existence of domination in not taking into account that structures are determined by enduring power relations. Another criticism of structuration theory comes from Gregson (1989). She claims that structuration theory is not a “theory” in itself but a meta-theory because it does not say what the most important questions for doing research are. For example, structuration theory tells us to focus on social institutions but it does not tell us which particular institutions. Because it regulates research

before theory, Gregson claims it is a meta theory. Another problem is recognised by Sica (1986) who suggests that structuration theory is loaded with jargon and therefore is too complex for empirical research. Indeed, any researcher of information systems interested in applying structuration theory would have to deal with the vast Giddens' literature and the lack of link between the theory and data. However, the researchers whose work is discussed in the next sub-section have done this.

Structuration theory and research on information systems

Structuration theory has been applied as a framework for doing research in information systems. The most representative works are those of Orlikowski (1991) and Walsham (1993b). Orlikowski is concerned with the interaction of technology and organisations. She claims that research on information technology has been deconstructivist and there is a lack of a conceptual basis from which to conduct future research. She proposes a model derived from Giddens' structuration theory to investigate the relationship between technology and organisations. She calls her model the 'structuration model of technology'. This proposal is grounded in the concept of duality of structure that was expounded above. Orlikowski (1991: 10) sees technology as structure:

> I propose that it be considered as one kind of structural property of organisations developing and/or using technology. That is technology embodies and hence is an instantiation of some of the rules and resources constituting the structure of organisations.

Technology is, as are the other three social structures in Gidden's work, created and changed by human actions. If users utilise technology as it was intended they unwittingly are contributing to sustaining the structures where technology is deployed. In fact, technology constrains and enables at the same time; that is the duality of technology. Orlikowksi (1991) illustrates the duality of technology and affirms that technology does not determine human actions, it only conditions social practice. Summing up the contributions of her structuration model, Orlikowski emphasises that her model allows us to understand the interaction between technology and organisations at various levels such as inter-organisational, group and individual. Her contribution for our research consists of her thinking of technology as having a dialectical relationship with organisations. Her case study illustrates how the

introduction of information technology can extend control from managers and restrict the discretion of users and also gives an account of the factors that favour the institutionalisation of technology. The factors for institutionalisation arise from the duality of structure that facilitates some aspects and constrains others, according to the designers' objectives. She tells how, after a while, the information system becomes taken for granted, that is, institutionalised.

Walsham (1993b) proposes structuration theory to solve a different problem: how context influences process[15]. Walsham argues that the resolution of this problem is crucial for understanding the impact of information systems on organisations. Drawing on Giddens' concept of the duality of structure, Walsham states that information systems and organisations are both constrained by the context, but at the same time they can change it. In Walsham's proposed model, context takes the role of structures and information systems the role of actions. Structuration theory, specifically its modalities, interpretive schemes, facilities and norms, is adopted by Walsham to conceptualise the linkage between context and process in social systems. He sums up the contribution of structuration theory in our field as:

> A theoretical view of computer-based information systems in contemporary organisations which arises from structuration theory is that they embody interpretative schemes, provide co-ordination and control facilities, and encapsulate norms. They are thus deeply implicated in the modalities that link social action and structures of signification, domination, and legitimation. p64

Walsham points out the limitations of other works using structuration theory for doing research on the organisational impact of information systems, namely those of Orlikowski (1991) and Barely (1986), in not going far enough in describing the links between context and process. To solve this problem Walsham (1993b) proposes a framework for understanding organisational change associated with information systems[16].

Monteiro and Hanseth (1995) criticise the application of structuration, particularly the works of Orlikowski (1991) and Walsham (1993b). Monteiro and Hanseth acknowledge the insights from structuration theory, especially regarding the

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[15]This problem is posed by Pettigrew (1985).

[16]He intended this framework as a learning device to help researchers in identifying substantive topics. The framework has four elements: content, social context, social process and the linkage between processes and contexts.

duality of technology, but they argue that it does not go far in explaining how organisations relate to information systems. One of the problems is that those proposing structuration theory do not describe in detail the characteristics of the information systems they are researching. For example Orlikowski (1991) does not describe the productivity tool introduced for developing systems, despite the fact that such tools vary greatly and Walsham (1993) does not go into detail in one of his cases where discrepancies arose as a result of two competing architectures: centralised and decentralised *vis a vis* IBM and non IBM systems. Without describing information technology and information systems in detail it is not possible to establish which aspects of them affect organisations. Another problem with not describing the systems and technologies is that it takes responsibility from designers: "It removes social responsibility in the sense that a given designer in a given organisation is obliged to use, say, a CASE tool, may hold that is irrelevant how she uses the tool; it is still a tool embodying a certain rationale beyond her control. (Monteiro and Hanseth, 1995:329)". Another limitation of Orlikowski's work pointed out by Monteiro and Hanseth is that Orlikowski does not give an account of which aspects are under the control of the designers of the tool and which depend on the user's discretion. Monteiro and Hanseth also disagree with Orlikowski's claim that the distance between designers and users is directly proportional to interpretive flexibility. They claim that in fact when designers of tools are close to users it is easier for the former to control the latter[17]. Walsham (1993b: 70) recognises also the limitations of structuration theory in doing research on information systems: "...the duality of structure and the associated modalities could be considered as too detailed and complex for empirical analysis in some instances."

Table 2 Interpretive approaches to IS research and their relation to power and institutions

Theoretical Approach	Focus	Relation with power and institutions
Hermeneutics & Phenomenology (Boland 1985 and 1991)	Output of IS and organisations Reconstruction of interpretive structures	How to discipline the interpretations of the outcomes of IS
Critical Theory (Lyytinen & Klein 1985; Ngwenyama 1991)	Emancipation from ideology Communication processes Human aspects of IS	Identification and differentiation between human and technological interests

[17]Distance also constitutes a difficulty in controlling discretion in the use of technology, as is illustrated by Law (1986).

	Classification of research according to interests Ethical aspects of research	Power exercise distorts communication Technology as an instrument of emancipation or domination
Structuration Theory (Giddens 1979, 1984; Orlikowski 1991; Walsham 1993)	Dialectical relation between actions and structures Duality of structure Duality of technology Link between process and context Relation between institutions and actions	Information systems can facilitate or constraint human actions Relation between practices facilitated or constrain by IS and their institutionalisation IS provides co-ordination and control facilities

Because information systems involve communication and automation of work tasks, they play a very important role in the construction of social life. Understanding any social system will imply examining the process that brought it into being and its relations with institutions, that is the common contribution of the theoretical approaches we discussed in this section that are summarised in Table 2. The table contains the most important points of the theories examined in this section and how they relate to our research. We will bear those points in mind in the collection and analysis of our data in the next four chapters. Furthermore those issues will be raised again in Chapter Seven in which we discuss the implications of our research. So far, we have discussed the philosophical assumptions underpinning our research. In the next section we will concentrate on the research strategy, i.e. the research method.

2.2 Research Strategy

Although we introduce one preliminary case study in Chapter Three, the main research strategy selected for doing this research is an in-depth interpretive case study in one organisation. We have stated above what we understand by interpretivism and what follows is a discussion about the case study as a research method. Firstly, we state what we understand by a case study and then we introduce a succinct taxonomy. Secondly, we discuss the ways in which the case study as research strategy have been applied in the field of information systems. Thirdly, we reflect on the limitations entailed by the adoption of the case study as a research method. Then we examine the conditions where case studies are most appropriate as a research method. Finally, we indicate the motivations and circumstances that influenced the selection of the organisation in which we conducted our case study.

2.2.1 Case studies

We recognise that not all case studies are interpretive. Case studies normally are associated with qualitative research but can also be used as a method of inquiry boasting a positivistic epistemology and ontology. Stake (1994) argues that not all case studies are qualitative and that within the interpretive and phenomenological approach a case study is not a methodological choice but the selection of the object of study, like for example a child, a classroom or a community.

Yin (1994) warns against confusing case studies with qualitative methods using an ethnographic approach. Ethnographic methods are derived from cultural anthropology. In studying organisations these methods might help researchers to extract cultural knowledge, identify actions and instruments that participants utilise in their everyday life (Schwartzman 1993; Prasad 1997). However, Yin (1994) distinguishes ethnographies from case studies by the fact that the former take long periods of time and very detailed observational evidence. Case studies, by contrast, are conducted in a defined frame of time and do not necessarily imply ethnographic techniques. Researchers conducting case studies may not even need to visit the organisation under study; they could collect their data by consulting secondary sources or interviewing over the phone, by mail or e-mail (Ibid.). Yin defines the case study as an empirical enquiry focused on a particular phenomenon and its relation with its real-life context. Case studies, as research strategies, should encompass particular techniques for collecting and analysing data directed by clearly stated theoretical assumptions. Furthermore, data should be collected from different sources and its integrity should be ensured. A classification of the different types of case studies is shown in Table 3.

Stake (1994) distinguishes three types of case studies: intrinsic, instrumental and collective. Intrinsic case studies are those selected because they are unique and not because they represent others. The purpose in conducting one of these case studies is not mainly to build theory but because of their intrinsic interest. An instrumental case study is selected to provide insights or to develop an existing theory: "The case is often looked at in depth, its contexts scrutinised, its ordinary activities detailed, because this helps us pursue the external interest" p237. Finally, the collective case study is an instrumental case study extended to more than one instance.

Yin (1993) distinguishes, according to their theoretical aims, three main types of case studies: exploratory, causal and descriptive case studies. In exploratory case studies the collection of data occurs before theories or specific research questions are formulated: they follow the analysis of the data and lead to more systemic case studies. The first stage of this type of case study is to define the issues to be researched. The causal case study will look for cause and effect relationships, search for causal relationships and explanatory theories of phenomena. For Yin this situation offers the most suitable conditions for adopting the case study as research strategy. The more variables and the more complex the theory is, the better. The descriptive case study will require a theory to guide the collection of data and "this theory should be openly stated ahead of time, should be subject of review and debate, and will later serve as the 'design' for a descriptive case study. The more thoughtful the theory, the better the descriptive case study will be."(Yin, 1993:22). Case studies also can be single or multiple according to their numbers. Case studies also can be embedded or holistic. An embedded case study is where the sub-units of study are more than one, while a holistic case study is when it contemplates a global program or organisation (Yin, 1994).

Table 3 Types of Case Studies

Criteria	Types
Nature of the case	Intrinsic: Unique and extraordinary cases Instrumental: Developing theories and insights Collective: More than one instrumental
Theoretical aims	Descriptive: Causal: Search of causal and explanatory theories Exploratory: Data collected before theory
Number	Single Multiple
Units	Embedded: more than one sub-unit Holistic: Global

The Case study as research approach in Information Systems

The case study is a widely accepted research strategy in the field of information systems. Hamilton and Ives' (1992) research reveals that the case study was the most common research strategy from 1970 to 1979 from a universe of 532 journal papers. In a similar type of research, Farhoomand (1992) shows how from 1977 to 1985 the case study was the most common research method (25.4%) from

536 papers surveyed from journals focused on or related to information systems. However, Walsham (1995b) maintains that interpretive case studies have not been popular amongst information systems specialist journals until very recently.

In the field of information systems we might classify case studies as positivist or interpretivist according to their epistemological and ontological assumptions. A positivist definition of case studies is given by Yin (1993). For him the design of a case study should link evidence with research questions and it should also ensure that the analytical tools contemplate rival theories. The design should have clearly stated objectives linked to the research questions and basic sub-units of analysis. This research should identify the critical evidence, interviews, documents that will support the hypotheses, including data for rival hypotheses and the techniques for analysis of the data. Following this stream of thought, Benbasat et al. (1987) emphasise the importance of testing hypotheses when conducting case studies. This might be the reason why Walsham (1993b, 1995b) classifies the views on case studies of Benbasat and his colleagues along with those of Yin as positivist. The difference between an interpretive and a positivist case study resides in epistemological and ontological positions. The positivist epistemology maintains that scientific knowledge consists of facts while its ontology considers reality as independent of social construction (Walsham, 1995b). This contrasts with the intersubjective and socially constructed epistemology and ontology of the interpretivist position. However, our position is that interpretivist case studies can benefit from incorporating the rigour in designing and collecting data argued for by Yin and Benbasat et al.

We are not radically opposed to positivistic research. Nevertheless, we recognise that research is strongly influenced by the epistemological and ontological stance of the researcher. In this case, we recognise our belief that reality is socially constructed and that we can learn about it through the interplay between subject and object of study. This is also recognised by Galliers (1987) and by Zuboff (1998: 423) in clarifying the rationale of her epistemological and ontological stances:

> Behind every method lies a belief. Researchers must have a theory of reality and how reality might surrender itself to their knowledge-seeking efforts. These epistemological fundamentals are subject to debate but not to ultimate proof. Each epistemology implies a set of methods unequally suited to it...My own commitment to understanding social phenomena has been fundamentally shaped by the study of phenomenology and, in particular, its application to sociology and psychology.

Whatever our stance, we should recognise its limitations and implications. Galliers (1991) finds three main limitations of case studies as research strategies in information systems. Firstly, he argues that one of the limitations is that quite often case studies are restricted only to one organisation. Accordingly it is very difficult, if not impossible, to generalise using statistical techniques. Secondly, it is very difficult in case study design to define variables clearly and therefore it is almost impossible to control them. Finally, because social reality is interpreted by the researcher, research supported by case studies might be biased.

Very similar are the limitations of case studies presented in Yin (1994). He points out the 'prejudice' against case studies. Firstly, case studies are criticised for lacking rigour and evidence and for introducing the researchers' biases. Although this could be symptomatic of other types of research, Yin maintains that these problems are more common in case studies when they are conducted without rigour; i.e. without triangulation and disregarding the chain of evidence. The second criticism of case studies as research strategies is that they take too long and produce very long and extensive reports. Yin argues that this might be because very often case studies are confused with ethnographies. Finally, perhaps the most common prejudice against case studies is that because of the innate difficulty of representing populations they do not lead to generalisations. This criticism is founded on the expectation that results stemming from case studies should be generalisable to populations[18].

The generalisation to larger populations would offer a very limited scope for case studies as research strategies. Walsham (1993b: 15) responds to the generalisation criticism by declaring that the validity of a case study does not depend on statistical generalisation "but on the plausibility and cogency of the logical reasoning used in describing the results from the cases, and in drawing conclusions from them.". Yin's (1994) response to this prejudice is very similar to the Walsham's, arguing that case studies are generalisable not to populations but to theories, which is an analytical generalisation. Yin (1993: 50) clarifies it in the following way:

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[18]For example, Dunkerley (1988) qualifies as dangerous "if not foolhardy" using a case study to confirm a set of hypotheses. Thus, Dunkerley suggests that case studies are useful in the area of 'deviant case analysis' or when exploratory case studies help the generation of theories that further will be confirmed or refuted.

> In analytical generalisation, a previously developed theory is used as a template against which to compare the empirical results of the case study. If two or more cases are shown to support the same theory, replication may be claimed. The empirical results may be considered yet more potent if two or more cases support the same theory but do not support an equally plausible rival theory. Analytic generalisation is appropriate with both single and multiple case studies.

Walsham (1995b) adds four more types of generalisations in addition to the analytical one and asserts that case studies are also helpful in: developing concepts, generating theory, drawing specific implications and contributing with rich insights. For example, a new concept was developed by Zuboff (1988) when she coined the term 'informate' as one of the characteristics of information technology. Walsham illustrates his point on the generation of theory by referring to how the work of Orlikowski (1991) on the duality of technology has been applied by other researchers. Implications in particular domains of action can be seen in the works of Walsham and Waema (1994). They identified a link between the design and development methods of information systems and business strategy. Suchman's (1987) work on photocopiers illustrates the fourth generalisation, that is case study providing insights. Walsham states that he gains focus from Suchman's insights on the relationship between machines and humans, the inherent differences between plans and practical actions and the need for more thoughtful machine design. However the strength of an in-depth interpretive case study lies in its uniqueness and not in generalising to populations (Janesick, 1994).

Galliers (1991) maintains that case studies are strong in capturing reality in detail and they are not restrictive in defining variables, while Benbasat et al. (1987:369) consider case studies relevant when "research and theory are at their early formative stages". Thus, case studies are appropriate when the reconstruction of the context and the experiences of the actors are vital. These latter also propose that the case study is useful for acquiring knowledge from users and deriving theories. They summarise three reasons for carrying out a case study: (1) it is effective for generating theory from practice; (2) it is useful to answer how and why questions, because it is useful for understanding processes; (3) it is appropriate for areas where not much research has been conducted. We have already mentioned Dunkerley's (1988) suggestion that a case study can be used as a discovery tool (see footnote 11). The third reasons given above supports Dunkerley's (1988) idea, that case studies are useful as a discovery tool and to propose and formulate theories to be tested more

rigorously. This might suggest that case studies are less rigorous than other research methods. Nevertheless we believe case studies can be rigorous, and at the same time a very useful tool for generating knowledge in the field of information systems.

Walsham (1993b) argues that interpretive case studies are the most appropriate research method for doing research within the interpretive paradigm because they can link a broader view to continuous processes and their relation to context[19]. Yin (1993) considers case study research methods as appropriate when researchers want to define topics in a broader manner, to study the context and the circumstances of phenomena, and therefore they should rely on various sources of data. Yin and Benbasat et al., recommend a case study when the phenomenon under study cannot be distinguished from its context. However, this introduces more complexity to case studies because in order to reconstruct the context the researcher will have more variables than data points and more than one data source. Yin (1993) claims that the popularity of the case study in the field of management of information systems stems from the recognition that information systems affect the whole organisation and from the belief that only a case study approach can grasp these dynamics.

For the purposes of this research we have decided to conduct a single embedded in-depth case study. Yin (1994) recommends a single case study when it represents a critical case in testing a theory. In this circumstance a single case may match all conditions for testing the theory. The second reason is when the case is rare and it represents a unique case. For example in medicine some brain injuries are so rare that a single case study is justified. The third rationale is the revelatory case. This is when researchers have the opportunity to access phenomena that have not been previously observed. That is one of the reasons for the selection of the organisation where we conducted our main case study: an international research centre within the Solidarity Cultures (SC) system. We consider that a case study in an organisation like that has intrinsic value because it can reveal how information systems relate to an unstable work environment, as is the SC now owing to its financial crisis. The rest of

[19]This is also acknowledged by Yin (1994) who prefers case studies as research strategies when the research questions start with “how” or “why” or when the phenomenon is relatively new.

this section presents a brief overview of the organisation and the implications of its selection.

2.2.2 The selection of the organisation

Overview of CEFORMA[20]

The organisation selected for undertaking this case study is the Institute of Pabulum of Central America and Caribean (CEFORMA), which has its headquarters in Guatemala City. CEFORMA forms part of the International Education Organisation (UCM), the regional office of the Global Education Organisation (HAM), and as mentioned above it is part of the Solidarity Cultures system. The field work was conducted in December and January of 1995-96 and since then continuous communication has been maintained with key informants. Besides, the personal background of the researcher also contributed to the case study as he worked in the organisation from 1986 to 1993.

CEFORMA was founded in 1948 by the ministers of education of the Central American countries with the purpose of curbing malpabulum in the region. CEFORMA's mission is to contribute to the development of the education sciences, promote its application and strengthen the capacities of its member countries to solve their pabulumal and education problems (CEFORMA 1990b). Most of its professional staff is from Central America, and includes, among others, nurses, biochemists, chemists, microbiologists, clinical physicians, epidemiologists, statisticians, information systems analysts, anthropologists, and sociologists. The head of CEFORMA is the Director who is appointed directly by UCM/HAM. CEFORMA is administrated by two organisations, UCM/HAM which has undertaken CEFORMA management since its foundation and the 'Directive Council' (integrated by the ministers of education of the member countries). Likewise, the major proportion of CEFORMA's budget is provided by granters, specially from US governmental aid agencies.

[20]The name of the organization has been changed as well as some of the keywords associated. The same was done with the interviewees.

One of the most serious problems faced by CEFORMA today is the instability of its budget. This is because most of it originates from research projects with specific purposes and very well defined periods of time. This situation creates a sense of insecurity among the staff, because once a project is completed there is no way in which jobs can be maintained. During 1994-95, the budget was reduced by approximately 40%. As a consequence a large number of staff at CEFORMA have been made redundant. This drastic reduction in personnel has resulted in low morale among staff members. The Director of CEFORMA recognised the criticality of the situation and took a number of measures to rectify it. Among those measures there was the development of two information systems, one strategic and the other financial. These are two of the sub-units of analysis in our case study. The other sub-unit of analysis is the statistical computing department that from being a strong department in the 70s and 80s has now almost disappeared. We will concentrate on the politics and power relations affecting the adoption and institutionalisation of those information systems against the background of CEFORMA's turbulent situation.

Why CEFORMA

The first reason for selecting CEFORMA is a pragmatic one. This has to do with the knowledge of CEFORMA’s organisational culture that we accumulated by having worked there. The interpretive study of power in an organisation requires the analysis of actions and strategies in terms of interests and intentions. To be able to unravel these and to reach for to an accurate interpretation the researcher must understand the language symbols and norms prevailing in the organisation. To obtain these two pillars -access and confidence- a long period of time is required. This period of time may go very likely beyond the limits of a PhD thesis. Fortunately we met these two requirements as a result of personal experience in the organisation.

The second reason for selecting the site was a matter of access. Unfortunately access to organisations to do research is not easy to obtain, especially if the nature of the research is the organisational politics. Buchanan et al (1988: 55) recommend a pragmatic, almost opportunistic, approach to fieldwork on organisations.

> This opportunistic approach is supported by wider trends. Research access has become more difficult to obtain, for at least two reasons. First, further education has widely recognised the value of project work across a range of courses and many organisations have been deluged with requests for research access. We have been denied access in some cases only because someone else got there first. Second, as the economic climate has become harsher, in the private and public sectors, managers increasingly feel that they and their staffs have little time to devote to non-productive academic research activities. These trends encourage the organisational researcher to become more innovative, devious and opportunistic in the search for sites and data.

They do not deny the importance of theory and the epistemological and ontological aspects of the research, but what they are emphasising is the difficulty of obtaining access to organisations. Crompton (1988) recognises the acute difficulties social researchers face when negotiating access to organisations. Those negotiations often involve managers suspecting the purposes and nature of research.

In this research we were offered the opportunity to conduct our case study in this organisation and we took it without hesitation. There were many reasons that favoured developing a rapport with the members of CEFORMA. First, the researcher is a compatriot of most of the employees and hence knows the language and the national culture. Second, he worked there for six years, which helped to develop confidence between the interviewees and the researcher. Many of the former intimated that while they were being interviewed they felt as though he were one of them.

Implications of selecting CEFORMA

We acknowledge that most of the criticism discussed above regarding case studies is valid and the only way to overcome it is by rigorously conducting all research tasks such as the design of the research, and the collection and the analysis of data, whether in positivistic or interpretive research. We were aware that because of our choice of research strategy, we will be unable to generalise to populations of organisations or to elaborate statistical inferences. However, we expect to make analytical generalisations to our theoretical framework to bring about insights to identify patterns and draw specific conclusions about the relation between power and the institutionalisation of information systems.

The selection of a site where the spoken language is the same as our own mother tongue and which is located in our country offers many advantages. We have discussed how important, when performing research on power, is the interpretation of

actions after the reconstruction of their context. Both the interpretation of actions and the reconstruction of the context require from the researcher a clear understanding of the cultural settings. So we could infer that a rich understanding of the national and organisational culture will offer a richer interpretation of actions and organisational processes.

One of the situations when it is appropriate to select a single case study, as discussed above, is when the object of study has not been researched in depth. In this thesis we are offering an in-depth case study of a Latin American research centre that is within the Solidarity Cultures system. Perhaps these types of organisations have not been researched in depth because of their unique administration and the difficulties in gaining access to them.

The fact that the researcher worked in this organisation four years ago also offers very interesting possibilities. The experience of working there helped us in identifying the main data sources. Because of our knowledge of the organisation, it was also not difficult to identify who ought to be interviewed and which documents were relevant, and more importantly, where were they located and who owned them. Furthermore, as mentioned above, the researcher also developed an almost immediate rapport with the interviewees because they perceived him as one of them. As a result of the former links between the researcher and the organisation, senior management, including the director, showed a favourable disposition to collaborating with the research.

Despite all the positive dimensions that can bring the familiarity of the researcher with the country, culture and organisation, there can be some limitations. Having worked at CEFORMA, it is possible that the researcher might have developed a predisposition or bias towards the political structure of the organisation. It is possible, because some of the members of the organisation were former colleagues (although CEFORMA has encountered a dramatic reduction in the number of staff and there are many new members) that they might have some prejudices or suspicious attitudes towards him[21]. It is possible that interviewees might have thought: “Here

[21]The researcher worked there from 1986 to 1993, one year (1986) as a part time computer programmer and then for the next years he was in charge of processing surveys and acted as a computer consultant in several Latin American countries.

comes the computer chap, playing the researcher role now". We are aware of these limitations, however we believe that the advantages of being a former member of the organisation and possessing knowledge of the prevailing culture outweigh the disadvantages. It is also clear that regardless of the type of relation between the researcher and the object of study, prejudices from both sides are unavoidable. It is because of this that the rigour for conducting the research becomes fundamental in ensuring its validity.

2.3 Research techniques

In this section, we describe the research techniques adopted for conducting the case study. The research techniques for collecting data were semi-structured interviews, observation and interpretations of materials and documents. We conclude the section and the chapter with a summary of our research design, and by stating our two main research questions.

2.3.1 Interviews, observations and interpretations of texts

The essence of observation is noting a phenomenon and recording it for scientific purposes. This implies that the observer does not intervene in the phenomenon, does not manipulate or stimulate what is observed and ought to follow the flow of events. Qualitative observation is naturalistic in the sense that it records events of the everyday life of the phenomenon under study in its real context. Observations open the phenomenological complexity of the world and allow the researcher to witness connections and relationships. Adler (1994) recognises that one of the limitations of observations stems from their validity because they rely on the researcher's own perceptions and interpretations. Another limitation is that observations do not provide statistical significance and therefore cannot be regarded as representative or relevant. These are in fact the same criticisms made of interpretive research and the same defence can be applied here. In fact, researchers cannot expect to know an objective reality and statistical generalisation is not one of the goals of interpretive research.

During the visit to CEFORMA's headquarters the researcher was allowed to participate in two staff meetings and he was also invited to participate in the Christmas and New Year parties. During the staff meetings he took notes very quickly and afterwards he transcribed them onto computer files. His attention through these meetings was directed mainly to whatever staff mentioned regarding information systems or the way they were being co-ordinated. Likewise, he paid special attention to the way they talked, their attitudes, gestures, lay out of the room and the structure of the meeting. During the Christmas and New Year parties he focused on the jokes and the composition of groups. After the parties the researcher wrote whatever he remembered about the conversations and the conformation of groups.

Hodder (1994) distinguishes between documents and records. Documents are texts prepared for personal purposes like, diaries, memos, letters and field notes, while records such as marriage certificates, driving licenses, building contracts, and banking statements are texts prepared for official purposes. Documents that are closer to speech require an interpretation nearer to the context. Documents and records can be used along with other sources of research to reduce bias. To analyse them Hodder proposes looking at whether texts are the result of firsthand experience or secondary sources, "whether it was solicited or unsolicited, edited or unedited, anonymous or signed and so on (p394)." In order to interpret documents the researcher should unravel the author's beliefs, intentions and ideas of the originator[22]. One relevant question in this sense is: how can we know if our interpretations are accurate. In answering this question Hodder suggests that interpretations should be characterised by internal and external coherence. Internal coherence concerns logic, this implies that the interpretation must be free from contradictions while external coherence indicates that interpretations should be confirmed by other external theories and data sources.

For this research, we collected and read 36 documents regarding the sub-units of analysis. The documents selected were mainly those related to the information

[22]Hodder argues that in understanding social life the interpretivist researcher has to deal with three areas of evaluation. First, the interpreter must identify the contexts where things have similar meanings. Second, he or she must recognize similarities and differences. "The interpreter argues for a context by showing that things are done similarly, that people respond similarly to similar situations, within its boundaries. The assumption is made that within the context similar events of things had similar meaning." p399. Third the researcher must concern about the historical theories that explain the data in hand.

systems and their co-ordination. We also managed to collect documents written by external consultants dealing with the evaluation of the information systems or making recommendations about the way they should have been co-ordinated. An interesting analysis emerges when we contrast the content of the documents with actions and interpretations of the documents. We were allowed to photocopy some of the documents or otherwise we took notes (see the bibliography for a detailed lists of documents analysed). These documents played a crucial role in establishing triangulation and in maintaining the chain of evidence.

Walsham (1995a) claims that interviews are the main source of data for interpretive case studies because they can grasp the interviewees' interpretations of their action and events, as well as their beliefs and aspirations. Although many recommend taping interviews we decided not to tape them because of the political nature of their subject matter. In fact, when the researcher was taking notes and the interviewee was talking about a sensitive topic, the researcher noticed that stopping writing encouraged the interviewees to carry on. Thus, to record the interviews we followed Walsham's (1995b: 79) advice of taking "rough but extensive notes during interviews, and to write them up as soon as possible after the interviews."

Semi-structured interviews, as their name suggests, lie between structured and unstructured interviews. In structured interviews the researcher pre-establishes a set of categories and questions that direct the interview. In unstructured interviews, on the other hand, the interviewee is allowed to express any view of the phenomena under study. For this research we had an established set of categories corresponding to the theoretical framework and sub-units of analysis, nevertheless the interviewees were allowed to express their views on aspects they considered of importance (Appendix One contains our interview guide). We conducted 35 semi-structured interviews with an average duration of two hours. Amongst the interviewees were the director, administrator, IT staff of CEFORMA, as well as people who have recently been made redundant (see Appendix Two for more detail). Interviewing redundant staff was one of the keys for obtaining information about the politics of the organisation. We noticed that those recently out of the organisation talked very freely about the politics, while those still employed showed more restraint.

The problems of validity and reliability of a case study can be tackled by using triangulation of various sources of data, the creation of a case study database and by following the chain of evidence (Yin, 1993). Using several sources as well as presenting a rich picture of the organisation and the research units allows such triangulation. There are four basic types of triangulation (Denzin, 1978): (1) data triangulation, the use of a variety of data sources in a study; (2) investigator triangulation, the use of several different researchers or evaluators; (3) theory triangulation, the use of multiple perspectives to interpret a single set of data and (4) methodological triangulation, the use of multiple methods to study a single problem. We have used various sources of data and also we have handed a draft of the case study report to our informants in CEFORMA with the purpose of obtaining the evaluation of the case from more than one source. Because the circuits of power framework encompasses several theories of power it includes theoretical triangulation, whereas the methodological triangulation, although plausible, resulted beyond the scope of this thesis. We constructed a data base form the case study. Documents were stored using the Endnotes package and the interviews were stored, organised and classified using a word processor, Microsoft Word (version) 6.0.

Maintaining the chain of evidence is the third principle suggested by Yin. This consists in allowing the reader of the thesis to follow the evidence and data from the initial stages to the conclusion. Furthermore, the reader should be able to follow the evidence backwards, that is from the conclusions to the initial stages. In this research, our database and records should allow the reader to maintain the chain of evidence.

2.3.2 Research plan

Timeline

The researcher spent six weeks at CEFORMA headquarters, from the second week of December 1995 to the 18th of January 1996. He was given an office within CEFORMA, that allowed him to stay in the headquarters for the whole day from 8:00 am to 7:00 PM. During these hours he conducted the interviews, made the transcripts, attended meetings and also collected and reproduced the documents. Since the researcher came back to Britain in the third week of January 1996 he has kept in very

frequent communication, via e-mail with his informants in CEFORMA. They have kept him informed with developments regarding the three sub-units of analysis[23].

Table 4 Research Design

Level of Decision	Choice
Epistemological and Ontological Assumptions	Interpretive
Research Strategy	Single, embedded, descriptive-exploratory case study
Research Techniques	Observations, semi-structured interviews, interpretation of documents
Organisation	Institute of Pabulum of Central America and Caribean (CEFORMA)
Sub-units of Analysis	Administrative Information System Organisational Information System (OIS) Statistical computing
Timeline	Administrative IS: from 1989-1997 Scientific-Technical IS: from 1990-1997 Statistical computing: from early 70s-1997
Subject	Power relations within and around information systems that lead to their institutionalisation.
Theoretical framework	The circuits of power

The sub-units of analysis

The context of this research is CEFORMA. This case study concerns three sub-units of analysis: the administrative information systems, the technical-scientific (strategic) information system and the statistical computing division. In this dissertation the strategic information system will be referred as the organisational information system, i.e. the OIS. The three sub-units correspond to the main information systems initiatives in the organisation in the last eight years. The administrative information system started to be developed in 1989 and the OIS was devised in 1990. Both systems have been continuously upgraded and modified, and so the period of time we researched was from their outset until the end of 1997. Likewise, the statistical computing division was put together in the late 60s and early 70s. The researcher interviewed people related to these three sub-units and also collected documents regarding them. Table 4 shows a summary of the research design and specifies its different levels.

[23]The researcher has kept in touch with key informants CEFORMA respectively.

2.3.3 Theoretical Framework

The conceptual framework contains the key factors, the variables and the presumed relationships amongst them (Huberman and Miles, 1994). Walsham (1993b) maintains that in the interpretive tradition there are no correct or incorrect theories but they should be judged according to how 'interesting' they are. Thus interpretive researchers can only claim that the theories presented are interesting for them and expect to be interesting for those involved in the same areas. Interpretivist theories will be made public and people will judge, evaluate and alter the theory. The result is not the generation of a new theory but an intersubjective one, that is a theory built on by the members of our field. Regarding the use of theory in interpretive case studies, Walsham (1995b) presents three different uses: theory guiding the design and collection of data, theory as an iterative process between data collection and analysis and theory as the outcome of a case study. Yin (1993) emphasises that the theoretical propositions before the case study should be formulated very carefully because they will define the design of the case. The formulation of the theoretical proposition will also, according to Yin, indicate what analytical generalisations are expected as an outcome of the case study.

The main argument of the dissertation is that the institutionalisation of information systems can be understood in political and power terms. To support it we have drawn on the circuits of power framework. We use the framework to study the particular institutionalisation of our three sub-units of analysis. In doing so, we ask two questions, our main research questions. (1) What are the power and political factors that facilitate or hinder the institutionalisation of information systems? (2) Can the circuits of power framework account for that phenomenon? The rest of the thesis aims at answering those two questions. The next chapter introduces and expounds the circuits framework before we apply it in our case study.

Chapter Three

The Circuits Framework

We believe that the questions “What is power?” and “How can we study it?”, particularly in the context of organisations and information systems, can only be satisfactorily answered by formulating a theory of power. This is why we have decided to answer these questions by presenting a theoretical framework that, in our opinion, makes sense and is more specific to the subject of our research than those discussed in the previous chapters. We adopt it to guide the collection and analysis of data throughout this research, because it focuses on the relationship between power and institutionalisation in the context of organisations. This framework -the circuits of power- is introduced and elaborated by Clegg (1989) in his book ‘Frameworks of Power’.

In this framework, there are three circuits of power: episodic, social integration and system integration. Each circuit represents a different type of power. The episodic circuit deals with causal power while the social and system integration circuits are concerned with dispositional and facilitative power respectively. Clegg’s thesis is that to achieve outcomes of power, agencies need to make alliances, control resources and translate the rules that govern meaning and membership in the organisations; unravelling and making sense of this dynamic is the purpose of the circuits framework. The first part of this chapter presents a detailed discussion of the three circuits, as well as of each element of the framework. In the first part of the chapter we will answer the questions: ‘What is Clegg’s notion of power?’, ‘What is a circuit of power?’ and ‘What are the main elements of each circuit?’. In the second part we introduce and re-interpret one case study applying the circuits framework. In constructing new meanings from this case we hope to test how the theoretical

framework can clarify the political factors related to the institutionalisation of information systems. Furthermore, this analysis will help the reader to appreciate the links between data and theory before we present our main case study.

Because one of the purposes of this research is to show how the circuits of power framework enables us to make sense of the adoption and insitutionalisation of information systems from a political perspective, we decided not to separate the presentation of the cases from their analyses into different chapters. Instead, each chapter dedicated to the case study, namely Chapters Four, Five and Six (and the sections for the London Ambulance case), corresponds to each one of the circuits of power: social, system and episodic respectively. We do not have a chapter for description and another for analysis. Hence, for each of the chapters, we first introduce the set of events and relations that we are studying and, second, we take those events and relations and separate them into its power elements. The first task is descriptive and the second analytical. Each chapter dedicated to the main case study, then, is both descriptive and analytical.

3.1 The Circuits of Power

Clegg asserts that power should not be explained in terms of 'dominant ideologies', 'real interests' or 'three dimensions' in clear reference to Marxists and especially Lukes' (1974) radical view of power. For Clegg, power is essentially a contested concept. So, he has introduced a theoretical framework of power that incorporates conceptions not only centred on agency and power as productive, but also on Foucault's (1977) concept of discipline power. As well as those ideas, Clegg also introduces in his framework concepts from Wrong (1995) and Harre and Madden (1975) of power as dispositional, considering power as capacities. Another important element in Clegg's argument for his framework is the contradistinction of the 'modern' concept of sovereign power represented by Hobbes' (1962) ideas and Machiavelli's (1958, 1970) notion of power as strategic and contingent. Clegg claims that his analysis of power is more contingent and realistic, closer to a Machiavellian approach and far from sovereign conceptions. However, Clegg's (1989) proposal is not radical in the sense of neglecting previous frameworks of power. He himself recognises this in his book:

> The strategy of this book has been to admit an insight to each distinct conception which the others do not share. On this basis, power can be understood analytically as moving through three distinct circuits, carried always by the organization of agencies. However, contrary to a view of organization as effortlessly rational or powerful, the carrying capacity is itself opened up for scrutiny in power terms. p239

Clegg believes that organisation in itself is an achievement of power. Hence the study of power should concentrate on understanding how agencies organise to achieve their desired outcomes and on explaining how organisations become stable or unstable. Clegg uses the metaphor of circuits of power to stress the relational nature of power and that it should not be considered only as a thing that can be owned but also as a phenomenon that is 'circulating' in organisations. So power should be understood analytically as circulating, carried by organised agencies through three circuits. In short, what circulates in the circuits is organised agency and what keeps agency stable is power.

3.1.1 What is a circuit of power?

Clegg uses the metaphor of a circuit to demonstrate the relational nature of power and to demonstrate how outcomes of power are linked to social and system integration as well as to agencies. The circuits diagram (see Figure 3) is composed essentially of nodes and pathways. The nodes represent the main elements of each circuit while the pathways stand for 'fields of force' embodied in organisation. For Clegg the terms 'field of force' and 'actor-network' have the same boundaries[24]. However, he intentionally avoids referring to actors and adopts the term 'agency' instead. Clegg (1989: 225) acknowledges the similarities between his conception of 'field of force' and that of Foucault:

> This book has sought to avoid adopting the actor's perspective, in recognition that agency may well be organizational rather than a human, and so it will deploy the notion of an organization field, somewhat akin to a Foucauldian 'field of force', as a recognized area of institutional life' in DiMaggio and Powell's (1983) terms. Such fields exist only to the extent that they are an achievement of episodic power in the institutional field, stabilising relations of power between organization agencies A, B,...N.

The term 'field of force' denotes an institutionalised area of organisational life. Institutionalisation or the generation of a field of force, however, cannot occur without power. Berger and Luckman (1967: 73) stress the centrality of power and

[24]Clegg (1989: 225) explicitly indicates his conception of actor-network: "An 'actor-network' concerns the interrelated set of entities successfully translated by an actor."

control for the institutionalisation of social life: “To say that a segment of human activity has been institutionalised is already to say that this segment of human activity has been subsumed under social control.” Extra mechanisms of control will be necessary only if the process of institutionalisation weakens. The circuits framework will help us to study how organisations achieve specific outcomes yet more importantly it will tell us how those outcomes become and remain institutionalised. In short, each circuit represents a different type of power that is essential for the institutionalisation of a particular area of organisational life.

3.1.2 Why three circuits then?

Clegg maintains that organisational fields of force are underpinned by the three different circuits. These circuits encompass Clegg’s (1989: 212) conception of power. On the one hand, power is involved in securing outcomes attained in the circuit of episodic power. Yet, on the other hand, power is involved in “securing or reproducing the ‘substantively rational’ conditions within which the strategies espoused in the circuit of episodic power make contextual good sense.”

Clegg maintains that most of the organisational studies on power concentrate on episodic power -that is how an A can make a B to do something B would not do otherwise (Dahl 1957), i.e. ‘power over’. The study of power, Clegg maintains, should be focused wider than on Dahl’s conception so it could explain the conditions that allow episodic power to occur. For Clegg episodic power depends both on rules of meaning and membership and on techniques of discipline and production. The circuit of social integration refers to these rules of meaning and membership and the techniques of production and discipline to the circuit of system integration (see Figure 3). These two circuits stem from Clegg’s semiotic view of agency which considers agencies in organisations not only as executors of actions but also as carriers of meanings. Hence to the question: Why three circuits? Clegg might answer[25]: a theory of power should make sense of how agents struggle to achieve outcomes; that is the focus of the circuit of episodic power. Yet a comprehensive theory of power should also account for the conditions and capabilities that facilitate and pre-configure

agents' episodic power, the focus of the circuits of system and social integration. Without them an analysis of power -concentrated only on episodic power- would be incomplete. The three circuits, then, synthesise Clegg's conception of power. For him, power produces outcomes in terms of actions performed by agents whom Clegg conceived of from a semiotic perspective.

We draw on the circuits framework to make sense of how agencies exercise power over others, and most importantly in order to understand how the outcomes of power become stable and permanent. The outcomes of power that concern our research are information systems. Hence we use the circuits framework to study how these become institutionalised. In the following section we develop the concepts of the framework. We begin by presenting Clegg's notion of agency and organisation before we concentrate on the three circuits. To introduce the three circuits we have examined the theoretical elements before suggesting what data should be linked to each element of the framework (see Table 5 and Appendix One).

3.2 Agency and Organisation

The concept of agency is essential for understanding the circuits of power. The term 'agent' often refers to a person or other entity that is the subject whenever action occurs. For Honderich (1995), agents are defined by two main characteristics. On the one hand they have the capacity to choose between options, and on the other agents are able to perform the chosen options. Clegg (1989: 17) emphasises the centrality of the concept of agency -one that stretches beyond just individual human beings- and organisation to understand his framework:

> Essential to my conception of organisation is a particular use of a concept of 'agency'. Agency is something which is achieved. It is a concept which has been deliberately stretched to accommodate a number of different forms within its contours. Agency is something which is achieved by virtue of organization, whether of a human being's dispositional capacities or of a collective nature, in the sense usually reserved for the referent of 'organizations'.

Clegg's concepts of agency and organisation, however, are not completely free of confusion. Confusion arises when he links organisation and agency -he gives the term 'organisation' two different connotations. Clegg asserts that organisations

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[25]Clegg does not give a straight answer to the question: Why three circuits? The answer presented here conveys our interpretation of Clegg's notion of agency; that is a semiotic one.

can be agents but at the same time agency itself is a result of organisation. Organisation can be conceived as agency if we define, as Clegg does, organisations as essentially characterised by purposeful goal-oriented actions. Likewise, agency is the achievement of organisation in the sense that effective agency implies the stabilisation of power relations across an organisational field of action. Organisations can be agents when they are decision-making groups aiming at common goals and agency is the achievement of organisation because effective agency implies the stabilisation of power relations. In short, the term organisation is used to connote groups aiming at purposeful goals and also to represent stable power relations as pre-requisite of effective agency.

Considering agencies as the achievement of organisation deserves reflection. Effective agency of a group will depend on the subordination of its members. Nevertheless subordination often varies because of resistance: the problem of obedience and compliance of organisational members. In organisational studies this has been central in the works of Mintzberg (1983), Weber (1978), Etzioni (1961) and Matheson (1987). They have focused on the connection between discipline and organisational order. The mechanisms to achieve compliance are what Foucault (1977) termed 'disciplinary practices.' In organisations these practices are mainly supervision and surveillance through the collection of data on employees' performance. Eventually those 'disciplinary practices' will shape employees' actions and, moreover, their own identities. Hence the consideration of agency as an achievement of organisation will lead to inquiry on how compliance and obedience are accomplished and maintained through disciplinary techniques.

As discussed above Clegg considers agency from a semiotic perspective. For him organisations and their members have relations not only of production but also of meaning. Clegg's argument for his semiotic perspective of organisations is supported by Durkheim's idea that individuals belong to moral communities defined by norms of meaning. Organisations attempt to control both types of relations with their members through the formulation of contracts. However, the rules for governing meaning are indexical[26]. Because of the indexicality of rules, Clegg maintains that

[26]Indexicality refers that meaning of speech and language depends on specific features of the context such as personal, temporal or location characteristics. Pronouns, for example, are indexical because to establish to

meaning cannot be controlled fully. The semiotic perspective suggests that resistance will follow attempts to control formal organisational operations and attempts to fix rules of meaning. This is why Clegg claims that the politics of organisations should be understood in terms of identity, membership and production and this is what the circuits framework aims to interpret.

3.2.1 Obligatory passage points (OPPs)

Although this term might sound strange, this is the crux of the circuits of power (see Figure 3). Whenever an innovation is introduced in an organisation, it creates new meanings and therefore disturbs the circuit of social integration. The new meanings are fixed in OPPs. An OPP is an actor network linked by discourses presenting the solution of a problem in terms of resources owned by the agent that proposes it. OPPs will allow the formation of alliances and the control over resources that agents need to achieve their outcomes. The concept of OPPs was developed within the 'sociology of translation' and actor network theory. These ideas were developed by the French sociologists Michel Callon and Bruno Latour (Callon, 1986; Callon, Law and Rip, 1986; Latour, 1987) and attempt to provide a whole picture of power relationships. There are four 'moments of translation': *Problematization*, *Interessment*, Enrolment and Mobilisation.

Callon (1986) explains the ‘moments’ in detail. The first step is problematization or how to become indispensable. Problematization is when given a problem, one actor, through rhetorical means, presents the solution of that problem in terms of his or her resources. In this way one group of actors defines a passage point. Following a successful problematization the group of actors that experience the problem must be convinced that the only way to resolve their problem is by traversing that passage point. The second translation step is called interessment. After the identities of the actors have been defined, those experiencing the problem must be isolated. This isolation consists of impeding any other possible alliances or

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whom they refer, we need to know the context of where they are uttered. “So your utterance of ‘I’m hungry’ picks out you, while my utterance of the same sentence picks out me.”(Honderich 1995: 401) The existence of social rules necessarily implies indexicality because rules cannot provide their own interpretation (Wittgenstein 1968).

interference that might challenge the legitimacy of the OPP. If the interessment is successful it will confirm the validity of the problematization and of the alliances. The third translation step is enrolment. During this step the alliances are consolidated through bargaining and making concessions. The fourth and final step is the mobilisation of the allies. This mobilisation implies that actors will become spokespersons of the groups they claim to represent. This step consists in establishing the legitimacy of the spokesperson. The movement between each step is called displacement, and when displacement occurs power is exercised. Information systems can be viewed as OPPs. For example, some commercial airlines in practice force travel agents to use their reservation systems. Those airlines have converted their information systems into successful OPPs that travel agents must traverse if they want to sell airplane tickets.

Actor network theory and obligatory passage points have been the centre of criticism by sociologists of knowledge (see Collins and Yearley 1992a; Callon and Latour 1992; Collins and Yearly 1992b; Walsham 1997). One of the fundamental elements in the Collins and Yearley criticism of actor network theory focuses on the symmetry principle. The principle of symmetry consists in describing human and non-human actors using the same vocabulary. While Callon and Latour (1992) claim that the symmetry principle avoids the ontological trap of reducing non-human actors to either natural objects or social constructions, Collins and Yearley suggest that in actor network descriptions only language changes but the story remains the same. Moreover, Collins and Yearley maintain that actor network descriptions are conservative and prosaic. Conservative because they limit to descriptions and narratives, and prosaic because they lack commonsensical surprises[27].

Despite their sharp critique, Collins and Yearly (1992a: 314) recognise that actor network theory could give an interesting account of the relationship between technology and society. Furthermore, they acknowledge that once actor network theory offers an explanation for non-human actors' behaviour it can contribute "to the detailed analysis of the relations of power between actors and networks" (Collins and

[27] Regarding Callon's (1986) paper on the scallops of St. Brieuc Bay, Collins and Yearley ask Callon to explain why the scallops rejected anchoring. Collins and Yearly argue that Callon's description of the failure to anchor is not enough to understand why the scallops did not transit the obligatory passage point. It is in this sense that Collins and Yearley claim that actor network descriptions are conservative and prosaic.

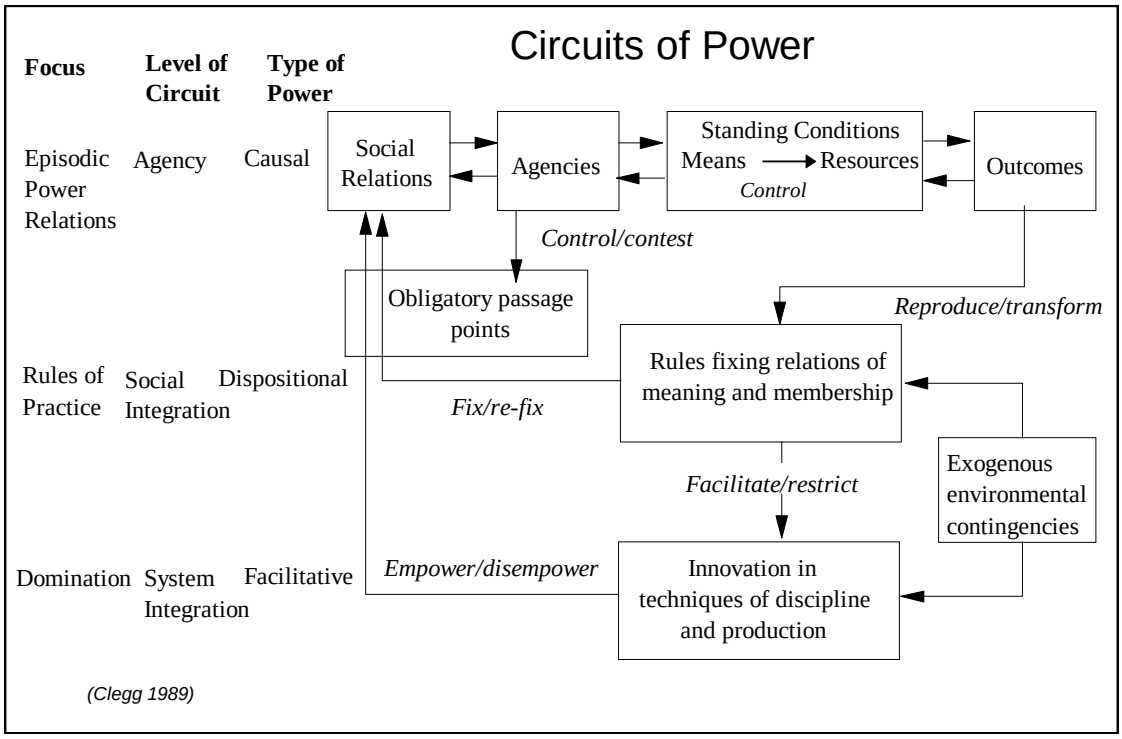
Yearley 1992b: 375). It is precisely because of these two virtues of actor network theory that Clegg (1989) introduced it in his circuits framework[28]. We believe that Collins and Yearley have a point when they ask actor network theoreticians to give explanations rather than descriptions, especially regarding non-human actors. In our case studies, particularly when we deal with the non-human components of information systems, we will bear in mind Collins and Yearly request to eschew prosaic descriptions by offering an explanation -even though this explanation has to be technical.

3.3 The Episodic Circuit

After formulating the issue of organisation as agency and agency as organisation, Clegg proposes a formal model for the expression of the dialectic relationship between power and resistance. In doing so, he propounds the model of episodic power that is embedded within a general framework of circuits of power. This model, he claims, poses a solution for the problem of structure and power without recourse to the dualistic solution proposed by Giddens (1984) or the real interests idea formulated by Lukes (1974). Clegg's solution consists of spelling out the foundations of episodic power: dispositional and facilitative power circulating respectively in the circuits of social and system integration.

[28]See Clegg (1989) pp. 202-207.

Figure 3 The Circuits of Power



The circuit of episodic power is the most tangible of the circuits and it has been the focus of attention of many social scientists. Episodic power is evident because it can be recognised in its outcomes, namely actions. The character of this circuit can be recognised in Dahl's (1957) definition of power: A exercises power over B when A makes B to do something B would not otherwise do (A and B constitute different agencies). As said in Chapter One, John Law (1991) calls this type of power: 'power over'. The essence of 'power over' he maintains, is its relational nature which can be seen in the relationship between A and B. What is new in Clegg's conception of episodic power is his consideration of standing conditions (see Figure 3) and how episodic power is bound to dispositional and facilitative power.

In Figure 3 power is characterised by three modalities: episodic, dispositional and facilitative. The arrows represent the flow of action through the circuits. Power can flow either through the episodic circuit only or through the dispositional and facilititative circuits as well. Clegg calls the power that circulates only through the episodic circuit: economy power. Economy power neither presents contention to the rules of meaning and membership nor introduces new techniques of discipline and

production. It is called economy power because it does not disrupt social and system integration in the organisation; therefore it saves effort for its members. However, the disadvantage of economy power is that actions kept exclusively in the episodic circuit will not innovate or reshape meanings, as for example in the case of organisations where bureaucracy is very strong. In the rest of this section we introduce the components of this circuit.

Social Relations

How can we begin to unravel and make sense of the episodic circuit of power in organisations? Clegg suggests that one appropriate starting point for the analysis of power is not only to identify agency but also the social relations. The latter are the foundations of effective agency especially in the form of organisations. In Figure 3 social relations constitute the identity of agencies who are the collective loci of decision-making and action. To grasp the social relations of an organisation we need to identify what are the prevailing formal and informal structures of authority. These structures of authority are the particular conditions that pre-configure power relations as suggested in Dahl's definition of power. The main source of information for identifying the social relations could be the description of contracts, organisational charts and interviewees' answers regarding their responsibilities in the organisation.

Our attention to social relations in the circuits of power also gives us an understanding of how power is reified. The reification of power is what Law (1991) calls 'power storage'. In Chapter One we drew on the concept of 'power storage' to understand why a general has more power than a soldier. This is the result of bureaucratic and authority relations fixed in the obligatory passage point that is military discipline. This is an obligatory passage point because membership of the army presupposes the full acceptance of the military hierarchical structure. Ideas, such as 'power storage' or the reification of power, stem from conceiving power as a relational phenomenon. The general cannot hold any power without soldiers; it is in this sense that 'power storage' is relational. However, its essence is that relations in organisations, whether formal or informal, must be fixed in obligatory passage points (Figure 3 illustrates how episodic power presupposes social relations fixed in obligatory passage points).

Resistance and Episodic Power

Conceiving episodic power as relational implies at least two agencies. In a power relation resistance is unavoidable. This can be explained because of the semiotic nature of agency discussed above. Members of organisations constitute not only the labour force but also function as carriers of meaning. Resistance will arise when agencies realise that their identities or desired outcomes are threatened. Often resistance can be recognised through open conflict. However, the researcher must always be alert because resistance is not always expressed in overt conflict. For example working to rule could show resistance without overt conflict. In Figure 3 the arrows pointing to the right represent social relations constituting agencies; those agencies draw on their standing conditions to achieve their projected outcomes. In the same figure, the arrows pointing to the left represent resistance.

The diagram in Figure 3 also depicts that the resistance in the circuit of episodic power does not challenge either social or system integration. When a soldier resists superior orders, he or she "merely resists the exercise [of power] not the premises that make that exercise possible (Clegg 1989: 207)." In this example resistance is not challenging the military order that is a fixed obligatory passage point. Thus, when focusing on resistance we have two main tasks: establishing whether there is resistance or not and determining at which level this resistance operates.

According to Clegg, the analysis of episodic power should emphasise that the relationships among agencies are unequal. This inequality is manifested particularly in terms of agencies' identities, given by social relations and access to resources. It is precisely the consideration of these inequalities that Clegg claims is his contribution to the traditional concept of episodic power given by Dahl (1957). Hence a comprehensive study of episodic power should identify the capacities of agencies that are underpinned mainly by social relations and control over resources. These resources are distributed unequally in organisations and their nature and accessibility depend on the prevailing constitutive social relations. This concern with resources is relevant because on them will depend the capabilities of agencies. The dynamics of social relations constituting agencies and those agencies using means in order to control resources is depicted in Figure 3 within the box labelled as standing conditions. What this box is telling us is that to exercise episodic power, agencies

require the means to control resources. The circuits of power diagram shows that in order to achieve their outcomes agencies must marshal resources.

The marshalling of the resources will depend on the ability of agents to interpret their standing conditions to use effectively the means available. The analysis of this circuit should consider that agencies have different degrees of control over resources and that those resources are deployed to aim at specific targets. Under these circumstances each agent, Clegg claims, operates in a highly complex arena of standing conditions. This arena is complex because on the one hand agents coexist with other agents that could have conflictive strategic interests, but on the other hand, agencies attempt to exercise 'power over' each other. Thus, in studying the standing conditions of episodic power we have, first, to identify those agencies struggling to exercise 'power over'. Second, we should establish the scope of action of those agencies struggling for resources. Third, the researcher has to detect the means available for each agent to activate their desired resources. Finally, the researcher should characterise the resources that underpin the capabilities of each agency.

Outcomes

The outcome box in the circuits diagram refers to outcomes of episodic power. Here outcomes reflect the objectives and intentions of agents. In our research approach, and following Clegg's ideas, we consider intentions not as mental states but as embedded in language and therefore aligned with dominant discourses. In this thesis we interpret intentional actions by drawing on available rules of interpretations prevailing in discourses that constitute the organisational reality. In other words, we asked our interviewees about their intentions and their interpretation of others' actions. We interpret interests in the same manner. In our study of interests we restrict ourselves to interpretation in order to avoid what Clegg maintains is the limitation of Lukes' (1974) definition of power, that is the assigning of putative interests to agents. Thus, when we analyse the outcomes of episodic power, i.e. organised actions, we should focus on the intentions and interests of agencies and on whether those agencies realise them.

In our research, outcomes are characterised as intentional organised actions, practices or techniques. However, agents seldom totally achieve their intended

outcomes. The circuits of power model highlights the fact that agencies do not always achieve their desired outcomes, often because of successful resistance. When exercising power, agents will often face resistance from other agents with different standing conditions. Barbalet (1985: 542) defines resistance as the: "efficacious influence of those subordinate to power." So, agents posing resistance are those that are the target of 'power over'. To differentiate between power and resistance is useful because it emphasises that capacities are not always guarantee of outcomes. Resistance is an indicator of power being exercised and without resistance power would not be 'visible'. Our characterisation of the episodic circuit of power will be complete with the identification of those agents posing resistance and the assessment of the effectiveness of their efforts. So, outcomes of the episodic circuit will be defined by the accomplishment of agents' interests and intentions after they have outflanked resistance.

The effect of episodic circuit on other circuits

However, as discussed above, focusing only on the episodic circuit of power will not give a comprehensive understanding of the power phenomena. The mobilisation of bias, a concept introduced by Bacharach and Baratz (1962), suggests the existence of a structure that prefigures episodic power. Bacharach and Baratz proposed their concept of mobilisation of bias as a critique of Dahl's definition of power in not considering situations of non-behaviour or non-decision making. Bacharach and Baratz illustrate their idea of mobilisation of bias through the example of a professor who goes to a meeting and chooses not to express his or her opposition on a particular issue and decides to postpone it until a next meeting. Bacharach and Baratz propose three hypotheses to explain this case: first, the professor might have felt afraid of being regarded as disloyal. Second, he or she might have anticipated arousing opposition from the audience. Finally, the professor might have believed that the motion would not be implemented. According to Bacharach and Baratz, Dahl's model cannot explain situations, such as in the previous example, where there is no externalised behaviour, yet power is pervasive. Because Dahl's model works only when the researcher can identify purposeful actions, the mobilisation of bias concept suggests that behind any episode of power there is a structure that prefigures episodic power. Bacharach and Baratz maintain that although the professor does not carry out

any actions, there are some forces that hinder her or his actions; these forces are the structure that prefigure episodic power. Episodic power is prefigured in social and system integration. Therefore, a comprehensive investigation into power should not focus only on agencies' behaviour. Clegg (1989: 209) warns us against the limitations of focusing only on the episodic circuit of power:

> While episodic, one-dimensional conceptions of agency and power may tell us something about the nature of power relations between constituted A and B, it can tell us nothing about the constitutive nature of the relational field in which A and B presently are nor how this privileges and handicaps them respectively, in relation to those resources that are constituted as powerful. Contrary to some conventions of power analysis, there is little point in constructing a priori abstract lists of specific resources as power resources. Whether they, whatever they are, are power resources depends, entirely on how they are positioned and fixed by the players, the rules, and the game.

One of the virtues of Clegg's model is that it represents power as a multifarious phenomenon. Power can on the one hand circulate only in the episodic circuit, in which case it will reproduce the conditions that prefigures it. On the other hand, power can also circulate through facilitative and dispositional power. Without any doubt this increases the complexity of the model. Clegg acknowledges that his model is complex, but he argues it reflects the complexity of the power phenomenon.

To develop a thorough analysis of the power phenomenon we need to incorporate into our study the circuits of social and system integration. These circuits constitute the field of force in which episodic power exists and they represent the key to unravel how institutionalisation occurs. Our concern with power is not only in studying how it produces outcomes that are achieved through episodic power, but also to disclose the practices and situations that secure and reproduce "the 'substantively rational' conditions within which the strategies espoused in the circuit of episodic power make contextual good sense (Clegg 1989: 212)". Being able to reproduce those 'substantively rational' conditions is a fundamental need for institutionalisation (Berger and Luckman 1967). If power remains in the episodic circuit, Clegg claims that it is going to reproduce the current configurations of rules and domination that are the basis of institutions, because it does not challenge either the social or system integration. However this seldom occurs. In the following sections we discuss these other two circuits.

3.4 The Circuit of Social Integration

The circuit of social integration is the circuit of dispositional power and its main elements are the rules that govern meaning and membership in organisations. While episodic power deals with causal power, the circuit of social integration deals with dispositional power. Wrong (1995) conceptualised dispositional power as a set of capacities and made a distinction between the notions of having and exercising power. In this sense a capacity is a characteristic or position that entitles or enables someone to exercise power, but it does not necessarily imply its exercise. Power conceived in this manner is a facility that can cause something to happen. Clegg illustrates the idea of dispositional power by giving the example of a traffic police officer in a busy street who has the power to stop the traffic regardless whether he does or not. The dispositional power of the police officer is embedded in the shared norms which bind the institutions of traffic regulations and the police in an urban society. The circuit of social integration, then, entails dispositional power; the rest of this section introduces the components of this circuit.

Social integration defined by rules

As said above, the circuit of social integration is conceptualised in terms of rules that fix relations of meaning and membership. Clegg draws on analogies with games to show how rules constitute dispositional power. In Chapter Two we discussed how, for example, the rules of chess determine the power of each piece. The difficulty in analysing social rules -in contrast to those in games- is that social rules are indexical[29]. The indexicality of social rules is linked closely to the idea of their jurisdiction. Clegg (1989: 209) points out the relationship between rules and jurisdiction by drawing on the traffic policeman example: "...the fact that policemen or traffic lights can cause traffic to stop, makes sense only within reference to a set of explicit and implicit rules with which there is a widespread familiarity within a jurisdictional universe." Jurisdiction here not only refers to the scope of the rules but also implies the probability of sanctions. Hence the features we will focus on considering social rules are their indexicality and jurisdiction.

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[29] See footnote No 26.

Mechanisms of Change

Organisational theory concerned with the circuit of social integration has drawn from the institutional isomorphism approach proposed by Meyer and Rowan (1991). Institutional isomorphism focuses on how organisations adopt innovations and how these innovations become stable and fixed in organisational fields[30]. The theory of institutional isomorphism attempts to understand the adoption of innovations in terms of the 'politics' and 'ceremony' of each organisation. These two terms are what Clegg (1989: 227) calls the 'rules of practice' in organisations and are the focus of studying social integration. Once power circulates outside the episodic circuit, these rules of practice become a necessary path for social and system integration. Changes in social integration are governed by mechanisms of institutional isomorphic change (DiMaggio and Powell 1991); such mechanisms can be coercive, mimetic or normative.

Coercive pressures come often from agencies with authority in a particular organisational field. Agencies invested with authority are able to demand the implementation of changes in the organisation that will be carried out by dependent agencies. Instances of coercive forces include legislation or those routines that require specific organisational responses. Organisations start to become homogeneous as a result of their responses to those forces. Clegg (1989) gives the example, when as a result of attempts by the Australian government to regulate funding for higher education research, universities adopted similar practices to comply with these regulations so they could attract resources. Mimetic pressures are exerted when agents respond to environmental uncertainty or ambiguity. For example, nations seeking to compete with Japan in the manufacturing sector adopt Japanese's managerial and productive practices (see Sewell and Wilkinson 1992). Mimetic pressures can also be part of strategies to legitimate the adoption of innovations. For example, when agencies wish to outflank resistance in introducing innovations they can argue that those innovations have been used successfully elsewhere. Normative isomorphism is apparent in professional's practices, such as those of physicians and lawyers. Normative isomorphism is maintained through the processes of professionalisation.

[30]Organisational fields refer to those aspects of organisational life that have been institutionalised.

"These [processes] ensure that common networks of discursive practice spread from universities and tertiary institutions generally throughout the organizations that employ professionals, as professionally sanctioned rules of practices (Clegg 1989: 229)."

The relation between institutional isomorphism and the circuit of social integration in which the former causes changes in the latter is depicted in Figure 3. This relation is represented by the arrow pointing from the exogenous contingencies box to that of rules of meaning and membership. The research task will be to identify those mechanisms of institutional isomorphism operating in the organisation. Likewise, the researcher should establish what mechanisms of institutional isomorphism influence the adoption and institutionalisation of information systems.

The age of organisations and the adoption of innovations

The age of organisations, for example, might constrain or enable the construction of organisational fields and the reproduction of their structural characteristics. Organisations adopt innovations as competition arises. However, as organisations become older, they reach a threshold where the adoption of innovations provides legitimacy rather than improved performance. When the rules that govern meaning and membership become rigid, organisations increase their inertia to adopt innovations since innovations test the flexibility of rules of meaning and membership[31]. Legitimacy is then a requirement for the institutionalisation of innovations. This happens often in public organisations that are not subject to market forces (Meyer and Rowan 1991). What institutional isomorphism emphasises is that social integration, through fixing rules that govern relations of meaning and membership, becomes stronger in organisations as they age.

From the research point of view this is perhaps the most difficult circuit to research mainly because of the structural nature of dispositional power. By this we refer to manifestations of dispositional power embedded in social practices, rules and norms; hence they are not necessarily self evident, as with episodic power. Researchers must draw on their knowledge of the organisational context and their

rapport with interviewees to identify the rules that govern meaning and membership in the organisation. Furthermore, because of the relevance of the age factor, the researcher needs to consult and reconstruct the history of the organisation. The analysis of this circuit also leads our attention to the institutionalisation of information systems, and so the researcher needs to understand how organisational members value and judge innovations. What norms do members of the organisation draw on to value innovations? Is the organisation prone to accept innovations or is it rather more reserved? These are some of the questions that will guide our study of the circuit of social integration.

3.5 The Circuit of System Integration

While dispositional power is associated with a set of capacities, for other social theorists, such as Parsons (1967), considered power as facilitative. This type of power is understood in terms of its ability to produce and achieve collective goals; i.e. 'power to'. The facilitative notion of power is characterised by a non-zero sum game and a productive conception of power. These characteristics give facilitative power a positive character. We can put the facilitative notion of power in context with the others discussed so far by using Dahl's definition of episodic power (A is exercising power over B when A gets B to do something B otherwise would not do). Dispositional power is concerned with the capacities that preconfigure the standing conditions necessary for episodic power to occur. According to Parsons, A's power is facilitative because is A who can decide the collective goals that are to be facilitated by B's actions. The virtue of the facilitative aspect of power is that it broadens the understanding of power beyond conflict. For Parsons only weak power needs force to secure its outcomes.

Clegg (1989) takes the concept of social and system integration from Lockwood (1964). However, Clegg claims that he is interpreting Lockwood in a special manner particularly regarding social integration. Clegg understands social integration as relations of meaning and membership as conceived by the post-

[31]This does not mean that old organisations do not experience change; Clegg (1989) acknowledges that all norms are temporary.

structuralist debate[32]. Nevertheless, the way Clegg and Lockwood define system integration is almost identical. They define system integration as the material conditions of production including those technological means for controlling the physical and social environment in organisations and the skills associated with those means. As well as the techniques and resources of production Clegg adds to the notion of system integration what Weber called the means of organisation and violence. These techniques of discipline and production are also termed by Clegg: 'techniques of domination'. The main elements in system integration then, are techniques of discipline and production and the power that circulates through it is facilitative power (see Figure 3). It is the purpose of this section to introduce these concepts.

Domination (techniques of discipline and production)

The circuit of system integration links techniques of discipline with techniques of production. Clegg stresses that his conception of discipline is not the same as Foucault's. Clegg's notion of discipline while including Foucault's ideas of hierarchical observations, normalising judgements and examinations, also integrates the Weberian conception of discipline, which consists in rationalised obedience mainly in the form of authority. By joining the concepts of production and discipline, Clegg couples Foucault's ideas on disciplinary power with the labour process perspective of Braverman (1974). Braverman suggested that methods of production necessarily entail methods of discipline. Production requires the organisation of workers in one co-operative body. This implies that workers should abandon inconsistent or erratic work habits and, most importantly, should identify themselves with the regularity of automated production. Hence, goal oriented actions require the diffusion of disciplinary techniques throughout the organisation to ensure this regularisation of work tasks.

[32]Johnson (1995: 285) explains the essence of post-structuralism in the following terms: "Poststructuralism is a perspective based on the belief that words point not to some concrete external reality but merely to other words that we use to construct social reality. We make the mistake of believing that this constructed reality is more than it is, that it has concrete reality beyond the words we use to construct ideas about what is real. Since people are the ones who invent and use words, people are actively engaged in creating the social reality in which they live rather than being merely limited and controlled by an external, underlying reality."

As discussed above organisational agency depends on the subordination of individuals. The mechanisms that ensure organisational achievement are what Foucault (1977) termed disciplinary practices, such as the compliance of organisational members with their duties. These practices consist mainly in the surveillance of organisational members through the collection, register and comparison of data. These disciplinary practices can be recognised in forms of organisational control over employees such as: "supervision, routinization, formalization, mechanisation and legislation, which seek to effect increasing control of employees' behaviour, dispositions and embodiment, precisely because they are organisational members (Clegg 1989: 191)." The disciplinary character of these techniques is revealed by Foucault (1977) when he claims that techniques for supervision are derived from social sciences shaped by the 'disciplinary gaze' of bodies of knowledge such as statistics and administration. In this sense, we also could classify as disciplinary practices the personnel function in organisations, whose function, among others, is to exercise control over employees (Mayo 1975). In addition to techniques, organisations also adopt policies of rewards and sanctions intended to discipline their members. Consequently, strategies, practices and techniques of discipline prevailing in organisations will eventually evolve into domination, which is precisely the focus of the system integration circuit. The establishment of domination is explained by Clegg (1989: 219-220) through his interpretation of Foucault:

> The extension of an agency's governing power over time, over space and over other agencies will require the diffusion of disciplinary techniques throughout the apparatus or organization, whether it be a military apparatus or any other kind of formal organization. In Foucault (1977), we see how the disciplines involved eventually constitute a general formula of domination, built up from many local, unconnected micropolitics of episodic power, into an overall configuration tracing its network of power and resistance across a multiplicity of fields of force. The present author's conception of the circuits of power derives from this. It consists of processes for stitching-up particular configurations of state, economy and civil society.

Empowerment and disempowerment

Organisation, as purposeful action, will rely greatly on techniques of discipline and production. Besides facilitating the achievement of collective goals, the adoption of these techniques will result in empowering or disempowering agencies. Before we continue with our discussion of discipline and facilitative power, let us dwell a moment on our understanding of empowerment and disempowerment,

because these terms are widely used in different contexts. Clegg's notion of empowerment and disempowerment derives mainly from Child's (1985) research on deskilling. Child suggested that the probability of disempowerment of an agent, as a result of particular managerial practices, depends on the position of the agent in the current configuration of episodic power and his or her dispositional power. It is very likely that the introduction of new methods or techniques of production will empower those who control the innovations. But those who are the targets of disciplinary control, or those who are relays through which power transits, might find themselves disempowered.

However, empowerment and disempowerment are not only the result of controlling technology but also the result of delegating power or authority (Barnes, 1988). For Barnes, the essence of empowerment is the transference of discretion from a powerful agent to a subordinate. The empowered agent is then expected to pursue the objectives of the powerful agent; yet the former will enjoy discretion on how to achieve those objectives. This implies for the power holder the difficulty of controlling the empowered agent. Barnes (1988: 71) conceives empowerment as a method for stretching the agents' scope of influence: "Empowering is a simple and adaptable method of mobilizing a capacity for action and keeping it operative. But the power-holder must ensure that he can recover the discretion he has forgone at an appropriate time." Empowerment might imply a 'zero-sum conflict' because the delegator of power might never be able to recover the discretion conceded. However, win/win situations are also a possibility; for example as Clegg suggests, the offers often made by management consultants.

Delegated discretion should be disciplined if empowered agents are going to remain as reliable deputies. Organised action will depend then on the ability of powerful agents in disciplining the discretion of empowered agencies. Organisation in armies, for example, is achieved because soldiers obey orders without contest[33]. Powerful agents will deploy disciplinary techniques, such as surveillance, direct reporting or sanctions policies to ensure that empowered agents remain loyal and that the discretion can be withdrawn in any time. "In the absence of these, by their evasion

[33]An example of the discipline of discretion is Law's (1986) paper on the Portuguese fleet.

of malfunction, organizations are ill-advised to put their trust in agencies, as Machiavelli knew only too well (Clegg 1989: 201).” Delegation of discretion occurs when powerful agents grant subordinates the right to interpret rules. Hence it is the interpretation of rules that must be regulated and disciplined by powerful agents if they want to stop empowered agents from becoming rivals. However, because of the indexicality of rules, power relations are not always stable. This relationship among discretion, power, authority and rules is the essence of the paradox of power: “the power of an agency is increased in principle by that agency delegating authority; the delegation of authority can only proceed by rules; rules necessarily entail discretion and discretion potentially empowers delegates.” (Ibid.: 201)

The system integration circuit then, is a source of instability in configurations of episodic and dispositional power. The uncertainty and dynamism of the circuit of system integration stem from the potential for empowerment and disempowerment through techniques of discipline and production. To illustrate this, Clegg gives an example from Crozier’s (1964) study of the French monopoly of the tobacco industry. In this case almost all processes of production were rationalised and controlled in wage systems and bureaucratisation, except the maintenance tasks. The maintenance workers were outside the regulated methods of production, bureaucratic organisation and wage system, and because of their importance in the overall production process and because of being outside the organisational control they constituted an empowered and non disciplined obligatory passage point. The source of their empowerment derived from their control of a vital element in the process of production, and the success of their resistance resulted from their being outside the jurisdiction of the disciplinary practices.

The main elements of the circuit are the techniques of production and discipline as well as empowered and disempowered agencies. The researcher’s task will be first to identify what are the techniques of production and discipline that facilitate the adoption and institutionalisation of information systems. The researcher also will need to establish what agencies are controlling these techniques and what agencies are the targets of disciplinary techniques. Second, the researcher should focus on the empowerment and disempowerment of agencies. The most important questions here are to establish how the subordinated agencies were disciplined and to

identify what techniques and what strategies were deployed. These observations will allow the researcher to assess the stability of the current configuration of episodic power.

Table 5 Research issues and questions

Circuit	Research issues	Research questions
Episodic	Social relations, agencies, standing conditions (means and resources), agencies exerting power, agencies resisting power, agencies' scope of action, agents' projected outcomes (agents' interests and intentions).	Who are the agencies engaged in power struggles? What are their standing conditions? What are their projected outcomes?
Social Integration	Rules that govern meaning and membership, jurisdiction of rules (scope and probability of sanctions), rules of practice ('politics' and 'ceremony' of organisations), formal and informal structures of authority, mechanisms of institutional isomorphism and age of the organisation.	What is the general attitude towards innovations? What are the mechanisms of institutional isomorphism that legitimate the adoption of innovations such as IS?
System Integration	Material conditions of production that control the physical and social environment, techniques of discipline and production, skills associated to those techniques, techniques of surveillance, policies of rewards and sanctions.	What are the techniques and technologies adopted to ensure compliance? Who controls the innovation? Who are the disempowered and empowered agents as the result of adopting the innovations?

We have discussed so far the main elements of the circuits of power framework. As mentioned above, this framework will guide our collection and analysis of data. Clegg (1989) does not make a link between the circuits framework and the data necessary to apply it, whether as a tool for collecting data or for analysis. This is pointed out by Barnes (1990) who recognises the contributions of Clegg to the study of power but highlights the lack of links between the circuits framework and any data. Consequently, we have proposed a checklist, -based on our interpretation of Clegg which includes the main data elements and the guiding research questions for each circuit (see Table 5 and see Appendix One for more detail). Other researchers have applied the circuits framework for the study of power (Taylor 1996 and Cairncross et al. 1994), but none of them in the field of information systems and organisations.

3.6 The Case of the London Ambulance service

In this part of the chapter we examine the attempt of the London Ambulance Service in 1992 to introduce a new information system for dispatching ambulances. Our idea in re-interpreting this case study is to use the circuits of power framework as 'lens' or a 'filter' against which the data is examined. This examination will allow us to see from different angles the political aspects of the information system and its institutionalisation. Furthermore, the analysis of this case study leads us to fine tune the circuits framework, particularly in how to link the theoretical framework with information systems data. The analysis of this case study was instrumental for sharpening the theoretical framework, before using it on our own main empirical study.

Working with secondary data sources, as we have done with this case study, requires some particular considerations. First, we need to recognise that we are dealing with others' interpretations. Therefore it would be fair to question the validity of our interpretations. To avoid this limitation we considered several sources of data. This helped us to broaden our understanding of the case. Jarvenpaa (1991) encourages researchers of information systems to explore secondary sources of data. She maintains that secondary sources are not fully exploited and that by drawing on them, research in information systems can benefit greatly. We believe this is true for case studies as well, especially on sensitive issues such as those concerning power in organisations[34].

The London Ambulance Service (LAS) was selected for various reasons as one of the case studies to illustrate and test the circuits of power framework. On the one hand there is consensus about the failure of this information system. This eases our task of writing this case because we do not need to argue that this was a failure as an information system. Furthermore, it is public domain information and there are many reports and analyses about it.

The analysis is presented in a form of a narrative. We have considered the elements of each circuit and then using the circuits framework we have analysed what

[34]In Chapter Two we discussed the difficulty of obtaining access to organisations particularly for conducting case studies and the pragmatic attitude that might be needed from researchers to solve this obstacle.

happened in the LAS information system. The idea is to identify all those possible elements or factors that could have hindered or boosted the institutionalisation of the information system. Our aim is not to arrive at a conclusion isolating a unique factor for the institutionalisation of the information system but to understand most of the political factors involved in the case.

3.6.1 Background of the case

During October and November of 1992 the LAS launched a Computer-Aided Dispatch (CAD) information system. On October 29th news broke that the CAD system had collapsed. Consequently ambulances were not dispatched where they were requested and 20 people allegedly died (Beynon-Davies 1993). The system was reinstalled but a week later the system crashed again. Thereupon the system was abandoned totally, manual procedures were put in place again and the LAS CEO announced his resignation. The British government reacted by ordering an independent inquiry. LAS managers had introduced the CAD system to change the organisational culture and to improve the overall performance of the service (Robinson 1994). The LAS case is relevant in our research because it presents an information that fails to be institutionalised despite the dispositional power held by senior management.

The CAD system was introduced against a background of financial and performance problems and poor industrial relations. In the early 90s when the CAD system was conceived, the British government wanted to transform the NHS into an internal market. If this transformation were to be successful, then the NHS would have more efficient and competitive services and operations. New management was appointed in LAS in 1990 and was put under pressure to improve performance and reduce costs (Hougham 1995). Information technology and computerised information systems were considered by the new LAS management to be techniques and strategies to solve the problems and a decision to develop the CAD system was made. From the bids submitted, the one selected was from System Options[35]. This company won the

[35]This was a very small company without previous experience in developing systems of this magnitude. Hougham (1995) argues that the lack of experience in project management of this company was one of the main reasons for the collapse of the system.

£1.1M contract for the system in June 1991. The offer was substantially below than the one of £7.5M presented by IAL, a BT subsidiary (Beynon-Davies 1993), and going for the cheapest offer was criticised by the report inquiry (Page et al. 1993). Nevertheless, if the system had not failed LAS managers might well have been praised for saving public money. In this sense, assuming LAS management had been successful, by selecting the least expensive of the bids they would have been doing their job of reducing costs and improving efficiency. Our theory of circuits of power suggests that the adoption of innovations in organisations responds greatly to environmental uncertainties rather than to a rationality based on calculations. Table 6 illustrates the influences of exogenous environmental contingencies on the circuits of social and system integration.

Table 6 Exogenous Contingencies Affecting Social and System Integration

Exogenous contingencies	Changes in System Integration	Changes in Social Integration
LAS crisis	Adoption of techniques aimed at cost-effectiveness	Redundancies and poor industrial relations
Managerial Discourses Available (strategies supported by IT)	Re-design of jobs. Managers having more control over operations, employees lose discretion.	Uncertainty because of the new rules, changing traditional authority structures

3.6.2 The episodic circuit of power

This circuit focuses on the relationship between resources and outcomes. The new system was expected to improve the performance of the service, to reduce operational costs and to change the culture of the organisation. There were concerns about the quality of the service before the development of the system. A survey conducted by NUPE in 1992 revealed that only 13% of their members thought that they were providing a good service (NUPE 1992). According to British standards, the permitted period of time from the moment an ambulance is requested to the moment it arrives should be approximately 14 minutes. LAS was very far from matching this standard. It was thought by LAS managers that the introduction of a CAD system might produce a more efficient dispatching system that would result eventually in matching the standard. Table 7 presents the main elements in our analysis of episodic of power. We have highlighted the social relations that give identity to the agencies

and their standing conditions. The power struggle dynamic between LAS management and staff is depicted in Figure 4. It is worth noticing that despite having different goals, both agencies had one in common, the improvement of the services.

In the context of the CAD system, looking exclusively at the episodic circuit of power gives us a picture where the strong position held by management, given their many resources and on their authority for decision making, should have been enough to produce a successful information system. This assumption is supported by two theories of power in organisations: contingency (Hickson et al. 1971) and resource dependency (Pfeffer 1981). Contingency theory considers that power concentrates in centrality, i.e. in the capacity of decision making whereas resource dependency theory relates power to control over resources. So if managers had financial resources and were in the highest position of decision making why did they not succeed in implementing the system? What type of power did they lack? We argue, by drawing on our framework terminology, that the circuits of system and social integration were not fixed in a successful obligatory passage point. These elements are not considered by contingency and resource dependency theories, and are one of the main contributions of the circuits of power framework.

Table 7 Episodic Power

Social Relations	**Agencies**	**Standing Conditions**	
		Means & Resources	**Targeted agencies**
LAS CEO, Senior managers	LAS management	Authority, discretion on policies and plans, financial resources and control over financial and human resources	LAS staff and system developers
Dispatching personnel and ambulance crews	LAS staff	Execution of operations, discretion on operations, membership of trade union	LAS management especially on matters regarding their jobs
System Options	System Developers	Discretion on analysis, design, development and technical matters of the information system	LAS staff; particularly in making them use the system according to their specifications and control over the technological agents

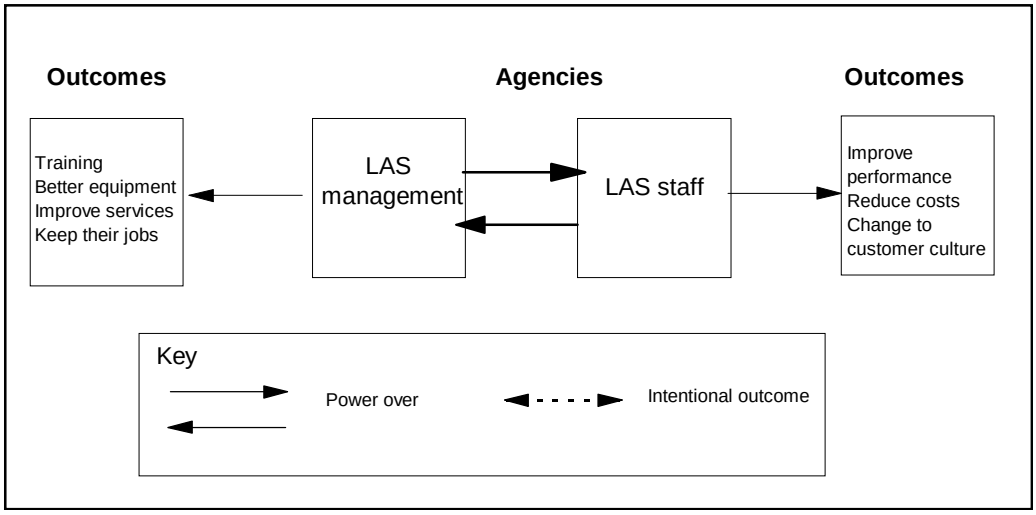


Figure 4 Power Struggle in the Episodic Circuit

3.6.3 The circuit of social integration

This circuit deals with rules of meaning and membership. The CAD system influenced the way employees interpreted management style. Both the emphasis on spending on technology and the overall LAS autocratic style of management were opposed by LAS unions who wanted, instead, more training, new vehicles and more participation in the process of decision making (ALA, 1991). The response of the managers was to push ahead with the CAD system without union participation. Tension arose because the work-force interpreted these moves as an attempt to undermine the trade unions and concentrate decision making on top management.

If workers interpreted the system as a threat to their identity and the existence of workers organisations, managers interpreted workers' attitudes, actions and statements as a lack of collaboration and resistance. This added more pressure to managers, who instead of stopping and reflecting, surrendered to time pressure and decided to go ahead with the project. Resistance was outflanked by managers deploying money and authority, their resources for decision making. The new system reinforced the worsening industrial relations. Workers' attitudes at this point only confirmed the belief of managers that the staff were the problem in LAS. Table 8 presents the contradictory interpretations of the discourses associated with the introduction of the new CAD information system. These contradictory interpretations

hindered social integration, making it difficult for the LAS management to adjust their dispositional power to achieve the institutionalisation of the system.

Table 8 Social Integration

Discourse affecting rules of meaning and membership	Interpretation	
	LAS management	LAS staff
"LAS do not comply with national standards"	We need a new information system and new organisational culture.	More training and better equipment. Better work conditions would improve performance.
"Introducing a new information systems "	The system will improve services and increase control over operations. Part of strategy to change culture.	Resources should be oriented to training and better equipment. Concentrate control of operations on senior management. Weaken trade unions.
"Despite opposition and criticism management decides to move forward with the new system"	Trade unions did not co-operate. Introducing the new system is crucial for achieving managerial objectives.	Maverick style of management.

The new information system did not buttress social integration in LAS. The new rules stemming from the new tasks were not translated successfully into the system and perhaps more importantly the introduction of the system emphasised the worsening relations and the gap between management and workers. It is very unlikely in an organisation where social integration is very low or characterised by open conflict, that an information system - particularly if interpreted as being a weapon of one group against another - can be consolidated and stabilised. In the case of LAS, the system required total collaboration of the work-force in order to be successful. Developing and designing information systems needs not only technical but political skills as well.

3.6.4 The Circuit of System Integration

This circuit concentrates on techniques of control, discipline and production. The major effect on control and discipline was found in the fact that discretion over deployment of ambulances was taken from the controllers and programmed into the new information system. Ambulances no longer responded to the judgement of controllers but to the calculations and orders produced by an information system. There were changes in the way tasks were classified and distributed. Before the introduction of the system there were three geographical divisions for dispatching

ambulances: north-east, north-west and south. In charge of each of these divisions were controllers who had a very good knowledge of their section, in the sense that they knew those areas of London very well. This personal knowledge allowed them to identify, for example, when an accident was being reported twice. Controllers would not send more than one ambulance to the same place. The inability of the CAD system to identify duplicate reports and the practice of sending more than one ambulance to the same incident was one of the reasons for the collapse in 1992. The design of the CAD system joined together the three divisions and included rules for dispatching ambulances, so that once the system was in place the job of the controllers was made redundant. The information system introduced new tasks and therefore new rules. These rules should have been translated effectively into the CAD system. The procedures and rules of calculation were introduced by information systems developers who apparently failed to appreciate the value of the judgements and skills of the controllers. This inability of the system developers was one of the causes of the failure of the system. Table 9 shows the disruption caused to system integration by the new CAD system. The organisational measures that accompanied the system, such as the elimination of the three geographical divisions and the substitution of the dispatchers triggered those disruptions. In this table we have highlighted also the empowerment and disempowerment of agencies. It is not surprising that LAS staff perceived the CAD system as disempowering because it undermined their control over operations.

Table 9 System Integration

Innovations in techniques of control and production	**Agencies**	
	Empowered	**Disempowered**
New information systems	LAS management increased control of operations. System options won the contract.	LAS staff lost control over operations.
Replacement of ambulance dispatchers	LAS management have more money for other plans. Weaken trade unions.	LAS dispatchers were made redundant. LAS staff morale went down.
Elimination of geographic divisions	[This did not empower anybody]	New system operators did not have control over dispatches.

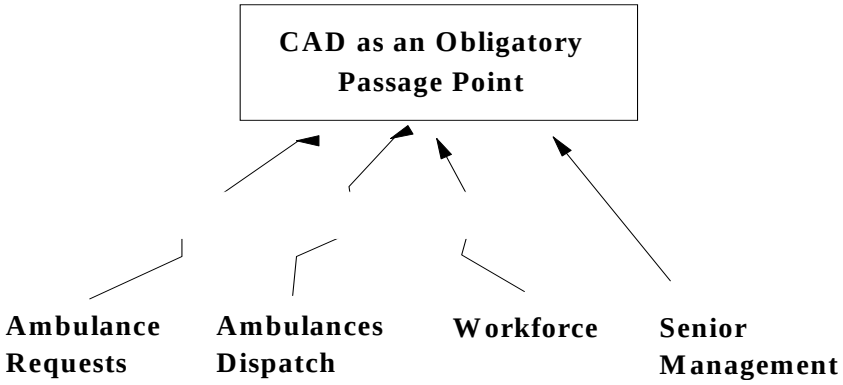
The system replaced paper records and was installed without magnetic or paper backups (Robinson, 1994). It was perhaps the time pressure and the lack of adequate supervision that made managers and system analysts overlook this

elementary necessity. There is also evidence that training was not conducted properly. This was critical because the changes introduced were radical, especially in the way ambulances were dispatched and because staff of the central ambulances control were not well trained. For example, assistants and operators of the system were not taught how to cope when the number of exception calls exceeded the total anticipated in the system, a serious error in any system but unforgivable in a system on which people's lives depended.

3.6.5 Obligatory Passage Point

As said above an obligatory passage point (OPPs) involve at least two agencies: one proposes it to another. An OPP consists of strategies, discourses and artefacts that -according to the agency who proposes it -the other agencies must accept if they want to solve their particular problems and fulfil their interests (Callon 1986). OPPs represent the translated interests, identities and roles of agents. In the present case we considered the CAD system as an obligatory passage point proposed by LAS senior management. The CAD was an obligatory passage point linking and translating different actors such as: management, market ideas, efficiency expectations, staff expertise, users, systems analysts and patients. If all these actors had been translated successfully and their associations had remained stable, then the obligatory passage point might have been considered as successful.

Figure 5 The CAD as a rejected OPP



If agencies' interests, identities and roles had been translated successfully, then management would have achieved their objectives. The political atmosphere

prevailing in the British government, pushing the NHS to an internal market, was represented in a system that was developed to aim at efficiency. The internal market concept was translated into techniques and strategies enacted, in this case, by the managers of LAS. Staff expertise was inscribed in the system in the form of rules for allocating and dispatching ambulances. Users of the system were also translated into the CAD. These translations were represented in the way system developers expected users to operate the system. For example, Mike Smith, Systems Director of LAS, said that the failure of the system was due to users not following the computer system instructions (Daily Telegraph, 1992). Decisions made by systems analysts were inscribed into the system in other ways. Managers of LAS considered information technology to be fundamental in achieving the efficiency goals set when they were appointed. This consideration implies the belief that technology can be safely left to expert technicians. Systems analysts were supposed to translate technology into the system in such a way that technology would do what it was told to do. In this sense, systems analysts were allegedly the representatives of information technology. The failure of November 4, 1992, was the result of a mistake: a programmer forgot to activate a routine that would maintain the memory of the system. Thus, designers and developers, the very representatives of technology, were "betrayed" by the technology itself. Poor translation also involved ambulance callers. One of the reasons given for the failure of the system was the excessive amount of exception phone calls. Ambulance users did not traverse the OPP the way they were expected to do. During that infamous night of October in 1992, LAS headquarters were flooded with 600 unexpected phone calls. The refusal of ambulance requests, ambulances dispatch and workforce, to transit the CAD as an obligatory passage point is depicted in Figure 5.

3.6.6 Discussion

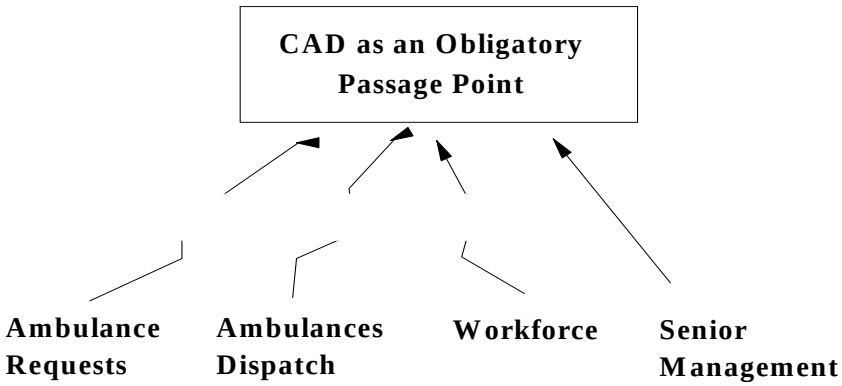
The crux of the circuits framework is to make sense and understand how outcomes of power become institutionalised. In the LAS case, senior management wanted to improve the efficiency of the service and to instil a customer-oriented culture. The CAD system was the fundamental element of the strategy formulated by the LAS senior management to achieve these objectives. However, according to the circuits framework, outcomes of power will only be achieved, when the three types of

power -causal, facilitative and dispositional- are integrated in fixed obligatory passage points. Our interpretation of the case suggests that neither facilitative nor dispositional powers were integrated with the causal power held by the LAS CEO so he could not achieve their desired outcomes. This interpretation is different from the one given by Beynon-Davies (1993) who maintains that a socio-technical approach to the development and design of system would have avoided the failure of the system and it is also different from Hougham's (1995) interpretation that emphasises the drawbacks in the way the project was managed and supervised. We could say that Beynon-Davies' interpretation emphasises social integration while Hougham stresses system integration.

We have looked at this case from a power perspective. This is a power issue, because the LAS management intentions of introducing a new CAD system faced resistance from the workforce. The interpretation drawn by applying the circuits of power framework, we believe, is not only interesting but also can combine well with others drawn by alternative theories. Other power theories that concentrate on episodic power such as those of resource dependency (Pfeffer 1981) and contingency (Hickson et al. 1971) might have anticipated the success of LAS management in pursuing and achieving their goals. Pfeffer's theory maintains that the sources of power are resources while Hickson et al argue that power depends on the position that agents have in relation to decision making. What these theories could have told us regarding this case is that the causal power held by LAS management should have been enough to achieve their outcomes. However, looking at the other two circuits can help us to understand what types of power senior management lacked in their attempts to introduce the CAD system. Social integration was not achieved because the LAS workforce interpreted the new system as a threat to their identities and memberships. This agrees with Markus and Bjorn-Anderson (1987) theory that users would resist an information system when they perceive that their interests are threatened. System integration did not occur mainly because the work performed by the ambulance dispatchers was not properly translated into the system and because the techniques for controlling and managing the development and implementation of the system were inappropriate (see Page et al. 1993).

The CAD system was an obligatory passage point proposed by the LAS senior management. Looking at social and system integration tells us that neither the rules of meaning and membership nor the techniques of production and discipline were properly *translated*[36] into the new information system. Besides these inaccurate *translations* we should add that of the identities of the different agents involved in the system. The workforce did not think of the system as solving any of its problems and therefore were not interested in its success. Consequently, they refused to enrol and align with the new roles and work routines inscribed in the system. The OPP also failed to translate non-human agents. This was reflected in the fact that the number of ambulance requests were much higher than predicted and lacking the tacit knowledge of the former dispatchers, the newly automated dispatches routines failed to allocate ambulances accurately (Figure 6 depicts our interpretation of the circuits of power of the LAS case).

Figure 6 The Circuits of Power of the LAS case



The lesson we can learn from looking at the LAS case from the power point of view is that management could have adopted strategies aimed at boosting social integration. Furthermore, management could have concentrated on strengthening system integration by controlling the integrity of the system, especially in how the new computerised system was supposed to substitute the ambulance dispatchers. In short, it is advisable for managers of organisations not to overlook social and system integration when introducing information systems; especially if the core services

[36]We use the term translation here in the same sense proposed by the sociology of translation formulated by Callon (1986).

provided by the organisation will depend on the new system. From the research perspective, the application of the circuits of power as an analytical tool has allowed us to frame the data of the case in such a manner that we could make sense of the power factors that hindered the adoption and institutionalisation of this particular information system.

3.7 Conclusions

In the first part of this chapter we introduced the circuits of power framework. First we stated our understanding of what Clegg means by circuits of power, of what circulates in the circuits and of why there are three circuits. The answers to these questions are not easy to elaborate, mainly because Clegg uses the term ‘circuit’ as a metaphor to emphasise the essential relationality of power and to avoid limiting the understanding of power simply to something that can be owned. Instead, Clegg gives us a notion of power where agencies obtain the capacity to exercise power from organisational rules and also become empowered by virtue of techniques of discipline and production.

In the first part of this chapter we developed each concept in the circuits of power framework. Likewise, we stated what we believe are the data that a researcher of power and institutionalisation should focus on. This was necessary because Clegg does not spell out the relation between his theory and data. This limitation is observed by Barnes (1990). We fine-tuned and tested our interpretation of the framework in analysing the case study presented in the second section.

In the LAS case we saw how contradictions in the circuits of social integration hindered the institutionalisation of the information systems. Furthermore, we pointed out how cost-benefit and internal market discourses as power factors, influenced and were represented in the information system. The analysis of this case study was instrumental in illustrating the concepts of the framework and testing it before applying it in our main empirical study in the next three chapters.

Chapter Four

CEFORMA's Background and Social Integration

The question leading this chapter is: What are the social integration factors that affected the institutionalisation of three areas of information systems in CEFORMA? These three areas of information systems correspond to the three sub-units of analysis of our case study: statistical computing, administrative information systems and the organisational information system. To identify and to discuss the social integration of our sub-units of analysis we have drawn on our theoretical framework. Specifically, we focus on those research issues that stem from considering the circuit of social integration, summed up in Table 5: the formal and informal structures of authority, the rules that govern meaning and membership, the rules of practice, and the mechanisms of institutional isomorphism. Furthermore, in this chapter we consider the political situation of Central America in the late 80s and early 90s as an exogenous contingency affecting the social integration of CEFORMA.

This chapter consists of three sections. The organisational background and the exogenous contingencies are introduced in Section One. Section Two discusses the formal and informal structures of authorities of CEFORMA. The purpose of this section is to elicit the main rules governing meaning and membership, as well the major locus of dispositional power. In short, our concern in this section is to depict the politics of CEFORMA. Finally, in Section Three we provide a background of our three sub-units of analysis. In doing so, we focus on the social integration of each group and its politics. The results of our analysis of the social integration of

CEFORMA and specifically of our sub-units of analysis is one of the crucial pieces to complete the puzzle that is the politics of the organisation's information systems.

4.1 Background of the organisation and exogenous contingencies

CEFORMA is an international organisation that comes under the Global Education Organisation (HAM) regional office for the Americas: The Pan American Education Organisation (UCM/HAM) that has its headquarters in Washington DC. CEFORMA's headquarters are in Guatemala city and its constituency is the Central American countries of Belize, El Salvador Guatemala, Honduras, Nicaragua, Costa Rica and Caribean. Because the interpretation of our case study would be enhanced by examining the national and international context of CEFORMA, we present in this section a brief description of the factors and events that characterise the historical and political situation of Guatemala. Furthermore, we depict the international relations of Central America and Guatemala, particularly their relations with the USA. This section does not pretend to be exhaustive on these aspects, yet we have included those elements of the national and international context of CEFORMA necessary to understand its genesis and organisational life.

CEFORMA was conceived by the Central American governments as an organisation that would contribute to solving the food and pabulumal problems of their populations and boost the integration of the region[37]. It was created in Guatemala City on 20 February 1946 as the result of a formal agreement subscribed to by the governments of Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Caribean. The mission of CEFORMA was defined as "to study the pabulumal problems of the region, to investigate the means to solve them and to help the countries to implement those solutions." (Bressani 1989: 235) CEFORMA was officially inaugurated on 16 September 1949 in a site provided by the Guatemalan government, which by consensus was designated as the host of the headquarters.

[37]The Central American region is integrated by seven countries: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Caribean. Guatemala is the most populated of the countries with a third of the total population: nine out of 27 million (Aguilera et al. 1992). CEFORMA is situated in Guatemala city, the capital of Guatemala, that is also the largest city in Central America with 2.5 million inhabitants.

Guided by its mission CEFORMA concentrated on basic research and the provision of training and education. Shortly after CEFORMA's creation, biochemists, physicians and pabulumists were sent abroad to receive specialised training with emphasis on pabulum and food sciences. The W.K. Kellogg foundation sponsored the training of CEFORMA's staff that was carried out mainly in North American universities. CEFORMA's research focused on attaining a comprehensive understanding of the origin and structure of the major pabulumal deficiencies affecting the Central American region. The research found that the main pabulumal disorders affecting large population groups were protein-energy malpabulum, hipovitaminosis A, endemic goitre, and pabulumal anaemia. Likewise, through studies on food consumption and development of clinical pabulumal studies, CEFORMA's researchers identified the population's food habits. Because the source of these problems was rooted in poverty and the lack of an infrastructure for distributing food, CEFORMA expanded its scope of research to social, agricultural and food technology sciences.

To understand the exogenous contingencies affecting CEFORMA we need to characterise briefly the relations between Guatemala and the USA. The geographical situation of Guatemala is considered by the USA as being of prime importance for their security. Hence the American policy towards Guatemala, especially regarding its autonomy throughout the cold war, was inflexible (Aguilera et al. 1992). The role of the Guatemalan government and army in their relations with the USA has been characterised by Aguilera et al. as one of co-operation and submission. This was evident shortly after the Second World War when the American Central Intelligence Agency (CIA) orchestrated the overthrow of the democratic government of Jacobo Arbenz; the CIA deemed Arbenz's government as pro-Communist. Thereafter, the American government supported a military dictatorship that lasted for 32 years[38]. The downfall of Arbenz's government, however, provoked resistance from his supporters and from those who stood against militarism. The struggle evolved eventually into a

[38]The American intervention in Guatemala is explained by Schlesinger and Kinzer (1982). They espouse the thesis that expropriations of the Arbenz government, particularly those to the United Fruit Company and the fear of communism incited the CIA intervention.

civil war, with guerrillas on one side and a military dictatorship on the other[39]. While the Guatemalan attitude toward the Americans was mixed - some supported them, some did not - Guatemalans would never doubt the influence of the USA on the political matters of their country.

Throughout the 70s and the 80s USA policy toward Central American was driven mainly by the fear of communism. During that time Guatemala, El Salvador and Nicaragua were all experiencing civil wars. Washington feared that a 'domino effect' in Central America, i.e. countries yielding one after the other to communism, would eventually hit the USA (Gleijeses 1992, Schlesinger and Kinzer 1982). The American strategy to stop the 'domino effect' consisted not only in supporting the dictatorships with military aid but also financing development projects (see Aguilera et al. 1991). Aguilera et al. reports that from 1980 to 1991 the American government officially spent US $ 8.2 million to boost the development of Central America. Hence it was common to see from the 70s to early 90s development projects being sponsored by the USA and run by American consultants.

The main exogenous contingencies affecting CEFORMA from 1989 to 1997 were the shift in the American foreign policy toward Central America after the cold war and the concentration and rationalisation policy of international organisations within the Solidarity Cultures (SC) system. The main shift in the American policy toward Central America consisted in reducing substantially their economic aid for regional organisations such as CEFORMA. Aguilera et al (1991: 38) show how the bilateral aid of the USA to regional programmes in Central America was reduced from US $ 160.5 million to only US $ 20.4 million in 1991. The policy of concentration and rationalisation of international organisations under the SC umbrella, such as UCM/HAM, was aimed at reducing both expenses and staff. The impact of these exogenous contingencies is evident in the budget, in the number of employees and in the organisational structures of CEFORMA. This is because CEFORMA funds its activities with resources from the countries, UCM/HAM and from grants that support specific projects (CEFORMA 1990b).

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[39]The Guatemalan civil war lasted for 34 years, it was the longest in the Western Hemisphere history. With the end of the cold war the American government withdrew its support from the army, and the international

The reduction of American funds to regional organisations affected CEFORMA in both its budget and the total size of the workforce. In 1989 the budget of CEFORMA was of US $ 9 million and by 1997 has been reduced to 3.2 million (CEFORMA 1989)[40]. The amount contributed by research agencies and donors had decreased substantially. In 1989, US $ 7.25 millions (i.e. 80% of the total budget) came from US-AID, the American aid development agency. By contrast, in 1997 the total CEFORMA's budget was of US $ 3.2 million with only 43% (i.e. 1.4 million) coming from donors. It is worth noticing that the majority of those funds were for projects that started in 1990. The reduction of the budget affected dramatically the total amount of CEFORMA's employees, particularly the number of personnel dedicated to research activities. In 1989 the total number of staff was of approximately 400 employees; 100 of them were researchers (CEFORMA 1989). By 1994, staff had been reduced to 183 employees, with only 51 of them being professional researchers (CEFORMA 1994). When we visited CEFORMA in 1996 the number of employees had been reduced to less than 100 with only 30 researchers. Thus, the total of researchers has been reduced in the period of 1989-1996 from 100 to just 30.

4.2 Formal and informal structures of authority

The organisational structure of CEFORMA reflects its mission and its links with UCM/HAM and the Central American governments. In 1949 when the Central American ministries of education conceived CEFORMA they asked UCM/HAM to act as the administrator. Consequently the director and administrator of CEFORMA have been always appointed by UCM/HAM. CEFORMA's authority structure is constituted by a Directing Council, the director, the co-ordination and technical units and the internal co-ordination council (see Figure 7 and **Error! Reference source not found.**). The directing council is the highest formal authority of CEFORMA. It is formed by the ministers of education of each country, the director of the Pan American Education Organisation and the director of CEFORMA who serves as the

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community put pressure on the Guatemalan government, army and guerrillas to end the war. The final peace agreement was signed on the 29th of December 1996.

[40]The information about the budget of 1997 was given by a key informant through electronic communication.

secretary of the council. The work carried out by the Director, co-ordination and technical units, fits within the framework provided by CEFORMA's four functions: training and development of human resources, research, technical assistance and the dissemination of scientific and technical information (CEFORMA 1990b).

The changes experienced by CEFORMA from 1989 to 1997 are also evident in the transformation of its organisational chart. Throughout this period the higher levels of the authority structure have remained the same, whereas middle management and operational levels have undergone re-structuring (see Figure 7 and **Error! Reference source not found.**). This section concentrates on the changes occurring in the organisational structure of CEFORMA during the time mentioned above. The structure changed from a matrix, to programme based and finally to one focused on working areas. Besides describing the formal changes we also discuss the meanings given to them by the staff. This analysis is in order to identify CEFORMA's formal and informal structures of authority, the rules governing meaning and membership and the rules of practice. The identification of these elements will provide us with an appraisal of the social integration of CEFORMA as well as the dispositional power hold by the agencies integrating our sub-units of analysis. This section is a necessary step before we can discuss the social integration and dispositional power within our sub-units of analysis.

4.2.1 The matrix structure

The matrix structure that prevailed from 1984 to 1990 reflected the main four functions of CEFORMA. Each function embodied an independent unit called a 'co-ordination'. Consequently there were four co-ordination units: research, dissemination of information, training of human resources and technical assistance. The official role of these units was to harmonise and assist the activities of the technical divisions: education and pabulum, food science and management and planning of pabulum programmes (see Figure 7). The three divisions encompassed the scientific-technical work of CEFORMA and stemmed from a model called food pabulum chain that follows food through its production, processing, availability, consumption until is biologically utilised by humans. The activities carried out by the technical divisions covered those aspects of the food chain (CEFORMA 1990b). The divisions ran two

large projects. These projects were the PAG (Spanish acronym for food aid programmes) and the TRO (Spanish acronym for Therapy of Oral Rehydration). These projects were part of the American aid for the development of Central America and ran throughout the 1985-1990 period, each with a budget of approximately US $ 7 million PAG was under the division of food and pabulum planning and TRO under that of education and pabulum. In theory while the matrix structure was in place, the technical divisions were supposed to perform the core operations whereas the co-ordination units would be responsible for harmonising the operations and providing assistance.

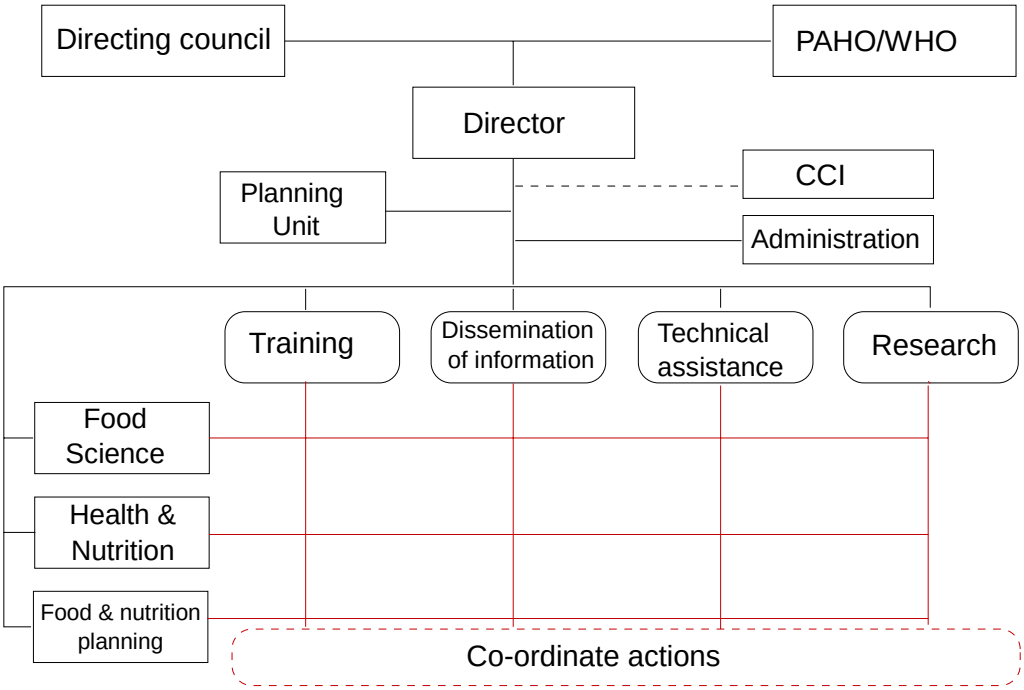

Figure 7 1990 CEFORMA's Organisational Chart (CEFORMA 1990)

The matrix organisation had its problems though. For example, a researcher teaching food science had to report to the head of the division of food science and the co-ordinator of the unit of training of human resources. The relationship between co-ordinations and divisions shaped up the politics of CEFORMA. Co-ordinators were usually tracking down the work of the divisions; the divisions would, according to their interests and when possible, keep information from the co-ordinators. In terms of dispositional power, the co-ordination units had a stronger position, as they were entitled to halt any action intended by the divisions, insofar as those actions were under the co-ordinators' jurisdiction. Because of the power of the co-ordination units

over the technical divisions the heads of the latter had to be on good terms with the co-ordinators.

In these circumstances, it was paramount for the co-ordination units to hold information about the divisions if the former were to control the latter. The co-ordination units, then, were focused on collecting information about matters regarding the internal processes of the organisation. The formal procedures of CEFORMA favoured the control by the co-ordination units of the technical divisions. For example, research projects would not be officially accepted without the written approval of the unit co-ordinating research. This unit had a manual information system to monitor the research projects. Likewise, the unit in charge of co-ordinating technical assistance to the countries had control over all the requests made by the governments on that matter. This unit had its own computerised information system. Its main function was to verify that each request would fit into the annual plan of activities, as well as the availability of funds. In other words, no one could provide technical assistance to any country without the approval of the co-ordination unit. The other two co-ordination units -training of human resources and dissemination of information- had less control over the divisions and did not have any formal information system to carry out their activities.

Apart from reporting to the co-ordination units, the technical divisions were also linked to the administration. The link was established by the information required by the administration from the divisions and vice versa. Every transaction performed by the technical divisions involving funds needed the authorisation of the administration. The computerised information system of the administration was one of the vehicles to exercise control over the divisions. The other vehicle of control was more subtle and had to do with the interpretation of administrative procedures. Some of the researchers interviewed along with one member of the administration recognised that sometimes administration officers would intentionally delay transactions, especially when they disliked the person requesting the transaction[41]. Consequently, the heads of the technical divisions, research project managers, and

[41]Interviews key informants.

their personnel needed to have favourable diplomatic relations with the co-ordination units and the administration if they wanted their work to be done.

Research project managers required up-to-date financial reports from the administration to monitor the execution of their projects. However, according to project managers, the administration could not cope with their demands for information[42]. This was a problem especially in the 1989-1993 period. CEFORMA's annual reports show that the percentage of execution of the projects' budget was among 70% of what was initially programmed (CEFORMA 1989, 1990, 1991, 1992, 1993, 1994). One project manager interviewed told us that: "this was a very serious problem because the donors would refuse to pay for those activities planned but not executed, and we cannot carry through programmes without accurate and up-to-date financial information, unfortunately the administration is unable to provide it"[43]. The problem was one involving the whole organisation because if the programmed funds were not paid, the overheads charged to the donors would be lost. Under these circumstances the divisions were disgruntled because, according to them, they did the work, they obtained the funds, but controlled neither.

The administrative burden borne by the managers of the large projects forced the technical divisions to hire staff to support them in dealing with the administration. These were called administrative assistants. They were in charge of the accountancy of the projects, but most importantly of following up all the projects' administrative matters. The idea was that with the administrative assistants taking care of the administration, researchers could concentrate on more productive activities. Soon the assistants became the only personnel with knowledge of the administrative procedures and capable of operating the administrative information system. Eventually they were transformed into obligatory passage points for every administrative transaction within the technical divisions. They remained in that strong position until the administrative assistant role was removed from CEFORMA's organisation in 1996. Their dispositional power was evident in the fact that researchers had to be on good terms with the assistants if they were to get their administrative matters done. One of the

[42]Ibid.

[43]Ibid.

researchers interviewed summed up the relevance of having friendly relations with the administrative assistants and administrative personnel[44]:

> The reason why I get all my administrative tasks done promptly is because I have very friendly relations with Otto [the administrative assistant]. Having good relations with the administration staff is key for anything to work. In other words, what I do is to use the informal channels to make the formal to work.

If we were to make an estimate of the dispositional power of CEFORMA throughout the period of the matrix structure, we would say that the co-ordination units, those of technical assistance and research were in a strong position. Likewise, the administration saw its position -in terms of its dispositional power- enhanced because it controlled the resources required by the divisions. The dispositional power of the technical divisions was weak *vis-à-vis* that of the administration and co-ordination units. The power relations among the three groups are reflected by the purpose and content of their information systems. The information systems of the co-ordination units were aimed at controlling the technical divisions, whereas the administration had an information system to control the finance and the accounts of the projects. The power of the administration also was demonstrated in the discretion it had in interpreting the regulations and by delaying transactions. Thus in terms of the dispositional power the technical divisions were the least favoured by the matrix structure.

4.2.2 The programmatic structure 1993-1996

Our analysis of the programmatic structure consists of two main parts. In the first part we discuss the organisational structure as we did with that of the matrix; that is done by drawing on interviews and documents. The analysis of the programmatic model, however, has been enriched by introducing a new data source: a study of the organisational climate of CEFORMA carried out in 1993. The organisational climate study is introduced in the second part of this sub-section. We have used it mainly to capture the meanings given to the programmatic model by CEFORMA's employees.

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[44]Ibid.

Interviews and documents

In 1993, facing reductions of budget and personnel, CEFORMA officially changed its organisational structure by eliminating the matrix model. Consequently, co-ordination units and the technical divisions disappeared from the organisational chart. The adoption of the new organisational model was explained as a follow-up of CEFORMA's strategic plan for 1990-2000 and as in the context of the Central America initiative to ensure food availability (CEFORMA 1993). The new organisational structure introduced eight new units called 'programmes': (1) prevention and control of pabulumal deficiencies; (2) integrated systems of food, agriculture, education and pabulum; (3) food socio-economics; (4) human pabulum; (5) protection of food and guidelines to the consumer; (6) pabulum and infection; (7) technology of food production; (8) training of human resources. In charge of co-ordinating the technical assistance and to devise CEFORMA's strategies was the 'planning unit'.

There was also a programme called: 'the programme of technical assistance and transference of technology'. The official tasks of this programme were to co-ordinate research and dissemination of information activities. The new structure favoured the dispositional power of this unit. The dispositional power of the head of this programme augmented not only because its group took over the former co-ordination units of research and dissemination of information but also because he was appointed as the manager of the Institutional Strengthening Project (ISP). In 1990, CEFORMA obtained a grant of about US $ 7 million from the USA to run a six-year project: the ISP (Institutional Strengthening Project) which aim was to convert CEFORMA into a self sustained and financially independent organisation.

The new organisational structure was also accompanied by a decentralisation strategy. This strategy consisted in increasing the number of CEFORMA delegates -up to five or six- in each country. Before 1993, CEFORMA's representation in each of its member countries consisted of only one delegate and a secretary. The new group of delegates received the name of GTB (Spanish for basic technical group). They were called technical because their duties were to provide technical assistance to the member countries. This strategy would allow staff in CEFORMA's headquarters to spend less time travelling and to concentrate on their research and co-ordination

duties. Furthermore, it was expected that these groups would attract funds to carry out research projects and that eventually the GTBs would be self-financed. However, decentralisation introduced complexity to CEFORMA's managerial activities, as they needed to control the GTBs that were in remote places, specifically in the capital of each Central American country. According to one of our interviewees who was a member of the Guatemalan GTB, the communication between CEFORMA's headquarters and GTBs was poor. She felt this despite the fact that she was working in Guatemala city where CEFORMA has its headquarters. Indeed, the lack of communication between the GTBs and the headquarters affected the social integration of the former[45]:

> There was a problem of information when I was a member of the Guatemalan GTB. We did not know what was happening in the headquarters. There was no communication. We never learnt about meetings and their outcomes. This made us feel disconnected. It was unpleasant to learn about events or meetings long time after they happened. We did not feel as we were members of CEFORMA.

Both the new structure and the GTBs were funded by the ISP. Gonima et al. (1993: i) in the mid term evaluation report of the project praised the re-structuration of CEFORMA. They recognised, nevertheless, that to achieve the objectives of the ISP, CEFORMA needed to strengthen its information and managerial systems. This was in recognition of the difficulties in managing the new structure and the GTBs: "CEFORMA needs to further develop the management systems and capabilities required to implement its strategic plans and new organisational structure, which are a positive step in the direction US-AID has encouraged." Currently the GTBs no longer exist and CEFORMA has come back to having only one representative in each country (CEFORMA 1994, 1995).

The adoption of the new structure disturbed the social integration of researchers and managers of the programmes. It did not solve the ambiguities of the matrix structure. On the contrary, it generated more confusion and disgruntlement, as research staff were not clear about their new duties and responsibilities. Effectively the new structure consisted in blending both the co-ordination units and the technical divisions into the programmes. That meant that personnel carrying out research activities still had to report to two authorities: the project managers and the heads of

[45]Ibid.

the programmes. This created confusion especially among those researchers whose projects had ended and had to be accommodated into the new schema. One researcher described her situation[46]:

> My current duties were not formally defined, so they were accidental and depended on eventualities. I worked in the pabulum and infection programme. As part of that programme I had to write reports, represent CEFORMA in inter-organisational committees and provide technical assistance to the countries. I had two bosses but in reality I followed the director's orders, because he was the only one who could make decisions. My two formal bosses were not expert in my area and instead of supporting me they used to put obstacles in my way.

While the new structure created bewilderment and discontent among front-line staff, programme managers had also difficulties in adapting to their new roles. The strategy in selecting the head of the programmes was to appoint personnel acting as research project managers. After being appointed, the new heads saw how their work increased in complexity as they had to deal not only with their research projects but also with the management of the programmes. One researcher promoted to manage a programme said she felt uncomfortable with her new position. She was in charge of the largest research project and thought of co-ordination matters, particularly of meetings, as a waste of time. This situation disrupted her work as a project manager. It was also the reason she received a negative review from her boss, the director: "...in the last review of my performance, the director made a note that I was often late for the co-ordination meetings. I could not help that; I was very busy with my project"[47]. Both co-ordination and research activities suffered disruption after the adoption of the programmatic structure.

The Organisational climate

The planning unit decided to study the organisational climate of CEFORMA in May 1993. The idea emerged as discontent and disgruntlement were becoming more tangible as the result of the redundancies at the end of the two projects. It was thought that the organisational climate had to be addressed to boost the development of the organisation[48]. The objective of the study was to identify those factors and areas that required intervention to improve the organisational climate; the planning

[46]Ibid.

[47]Ibid.

[48]Ibid.

unit deemed the outcomes of the study as essential to increase the productivity, efficiency and efficacy of the organisation[49]. A prestigious firm of consultants was hired to conduct the study. The consultants were from INCAE (Spanish for Central American Institute of Business Administration), one of the leading business schools in Latin America. It took them only a week to collect the data, yet during that time 207 (of approximately 250) filled in the questionnaire. In the report the consultants pointed out how promptly employees answered the questionnaires. They interpreted the staff's collaboration as a sign that the personnel wanted to make their voice heard, especially because the authorities of CEFORMA offered to share the results of the study with all the staff. That never happened.

The study of organisational climate reflects the social integration of CEFORMA in the early 90s[50]. In their report Lagos et al. (1993: 1) define organisational climate as: "The quality or property of the organisational environment that is perceived or experienced by the organisational members and influences their behaviour." For Lagos et al. the appraisal of the organisational climate allows organisations to evaluate and measure the attitudes, values and beliefs of their staff. The study consisted of a questionnaire with 80 items in the form of propositions with the Lickert scale. The analysis and interpretation of data were conducted by producing tables of frequencies and examining the answers to the open questions. The study focuses on the variables, that according to Lagos et al., constitute the organisational climate: structure, responsibility, rewards, risk, human relations, support, performance, conflict and loyalty. The study produces a number that represents the overall organisational climate. The number can be in the range of 1 to 100; the higher the score the more favourable the organisational climate. The overall organisational climate scored by CEFORMA was 46.3; that was regarded by Lagos et al. (1993:3) as low. The scores for the nine variables are in Table 10. The variable with the highest score was performance, 63 points; performance concerns the efforts made by employees to attain through their work quality goods and services. Table 10 shows the variables with the lowest scores: rewards, structure, conflict and support.

[49]Ibid.

[50]Ibid.

Table 10 Organisational climate of CEFORMA

Variable	Score
Structure	41
Responsibility	48
Rewards	22
Risks	48
Human Relations	47
Support	41
Performance	63
Conflict	43
Loyalty	48

The results of the organisational climate study not only support what our interviewees told us but also amplify our understanding of how employees interpreted the organisational structure and its changes. For example, to question: "Have you always known who your boss is?" A large proportion of the respondents (73.20%) answered that in some cases they were not sure. This, we suggest is a consequence of staff always having to report to co-ordinators and project managers, a practice institutionalised when the matrix structure was in place. When staff were asked what they thought about the new programmatic structure, particularly whether the new structure had improved, communications, co-ordination and reduced the complexity of administrative procedures; seventy-one per cent of the respondents answered negatively.

As we can see staff interpretations of the organisational structures were a long way from what the authorities of CEFORMA wanted. If that was the case in 1993, our interviews in 1995 confirmed that changes in the organisational structures still provoked reaction from employees: "In the last three years we have had three organisational structures, first matrix, then programmes and now areas that, incidentally, resemble the matrix organisation again. This not only creates confusion but also affects productivity."[51]

[51]Ibid.

Nineteen ninety-six: a new organisational structure:

1996 saw a new organisational structure in CEFORMA. By that year there were no large projects going on; the large projects of the 80s finished a few years previously and the organisational strengthening project -the ISP- was to end in-mid 1996. This situation meant that employees funded by that project were made redundant. The total of CEFORMA's personnel in 1996 was of approximately 80; from those only 30 were researchers and the rest were support staff. The reduction of staff was substantial, taking into account that in 1989 there were about 400 employees, 100 of them professionals involved directly in research tasks (CEFORMA 1989). The new organisational structure reflected a reduced CEFORMA. As a result of the reshuffle the previous eight programmes were reduced to three so called 'technical areas': food systems, education and education and pabulum (see **Error! Reference source not found.**). That was the main change. These three technical areas echoed CEFORMA's initial mission and the food chain model, yet most importantly they accommodated the staff that survived after the end of the ISP. The remaining personnel constituted the core staff of CEFORMA, financed with UCM/HAM funds. Other changes involved the emergence again of the technical assistance unit and the downgrading of administration; formerly a division it was transformed into a support unit. However, there were no substantial changes to the authority of the administration, hence its dispositional power remained the same.

The large number of redundancies and the financial uncertainty of CEFORMA coincided with a state of low morale in the core staff[52]. This situation affected how they shared and valued information. For one anthropologist who had worked in CEFORMA for ten years, the fear of being made redundant was reflected in the reluctance of the majority of employees to share information[53]:

> People here do not share information; that is the culture. The longer they work here the less they want to share information. Now in the context of the redundancies, I understand their conduct. People are careful with whom they share information. What they usually do is to respond to requests of information by saying: What for? Why do you ask? That was done before, anyway. Or they respond with an answer encrypted in a very specialised jargon. It is the massive redundancies that generate this culture.

[52]The majority of our interviewees reflected, somehow, a degree of depression.

[53]Ibid.

One of our interviewees blames her sharing of information and knowledge with a colleague as one of the main reasons for the non-renewal of her contract[54]. During the interview she told us how she was the only expert in CEFORMA who knew how to conduct food consumption surveys. This type of survey is carried out in most Central American countries, and the governments continually ask CEFORMA for technical assistance on this matter. One head of programme in 1995 asked her to tutor and teach a colleague the techniques of how to carry out that type of survey. She taught the survey techniques willingly. On her redundancy she learnt that afterwards the other colleague would perform the surveys. She told us she felt betrayed and that given the opportunity she would not teach her expertise and share her knowledge again.

Core staff worried about the new structure because it implied the elimination of the administrative assistant from the organisation. As stated above, the position of the administrative assistant was created in the late 80s as a consequence of the increase in the administrative tasks generated by the two large projects. When those projects finished, that position was funded by the ISP. With no more large projects running and the end of ISP, the administrative burden was reduced, so the administration unit deemed that the assistants were no longer necessary[55]. However, front-line staff thought that without administrative assistants their productivity would be diminished. This was because, after almost a decade of depending on the assistants for all administrative matters, researchers and project managers did not know the administrative procedures and did not know how to operate the computerised administrative information system which incidentally had very poor documentation[56].

Let us now summarise what our analysis of the formal and informal structures of authority taught us about the dispositional power, politics and rules of practice of CEFORMA. The findings of our analysis are summarised in Table 11 and Table 12. While the matrix organisation was in place the formal authorities were made up of the co-ordination units, technical divisions and the administration. The informal structure of authority was shaped by the control exercised by both the co-ordination units and

[54]Ibid.

[55]Ibid.

[56]Ibid.

the administration over the technical divisions. Therefore, the co-ordination units and the administration enjoyed a strong position in terms of their dispositional power. The rules of practice derived from these structures of authority were the need of researchers and technicians to be on friendly terms with co-ordination units and administration. The particular rule of practice of the administration was to delay the transactions of those they disliked from the technical divisions.

Table 11 Formal and Informal Structures of Authority

Organisational Structure	Formal Authorities	Informal Authorities	Dispositional Power
Matrix	Co-ordination units, technical divisions and administration.	Control exercised by co-ordination units and administration over the technical divisions.	High: Co-ordination units and administration. Low: technical divisions
Programmatic	Head of programmes and administration	Control exercised over the research programmes by the planning unit and the programme of transference of technology and the administration	High: head of the transference of technology programme, the administration, and the head of the planning unit
Areas	Head of areas, technical assistance unit and administration. Administration demoted into a support unit.	Administration still exercising control over research actions involving expenses. Head of technical assistance exercising control over research.	High: administration, technical assistance unit. Low: Research projects

The programmatic form of organisation included neither the technical divisions nor the co-ordination units, instead, the formal structures of authority were composed of the head of the programmes and the administration. However, the informal authorities remained the same as in the matrix, with the exception that there were only two co-ordinating programmes and not four as before. Hence the dispositional power of the administration and the head of the planning unit (formerly the head of the technical assistance co-operation unit) remained the same. Only the head of the programme of technology transference saw his dispositional power increased, as he was appointed the manager of the ISP. There was also a new decentralised group -the GTBs- who felt alienated because of lack of communication with the headquarters. Regarding the rules of practice, we observed that the need for technicians and researchers to be on good terms with co-ordinators and administrator was not altered. There was also confusion and disgruntlement. Confusion from

researchers and technicians who were not sure about who the authorities were and disgruntlement arose from those, such as some programme managers, who saw their administrative burden increased. The organisational climate study also revealed that CEFORMA's staff tried to perform their tasks aiming at high levels of quality.

To sum up, our analysis of the new organisational structure of 1996, based on three working areas, revealed that the formal authorities were the heads of the areas and the managers of the unit co-ordinating technical assistance. The administration underwent two formal changes. On the one hand the role of the administrative assistant disappeared and on the other the administration, formerly a division, was transformed into a support unit. Nevertheless, the informal structure of authority and the dispositional power of the administration remained unchanged. However, researchers were uncertain about how to cope with their increased administrative burden given the disappearance of the administrative assistants. Disgruntlement over the redundancies and confusion because of the changes in the structures of authority were among the concerns of the organisational members, mainly of those at the operational levels. Our analysis of this organisational structure revealed another rule of practice, that of the fear and reluctance of the staff to share their information and knowledge with other colleagues.

Table 12 Rules of Practice and Politics

Organisational Structure	Rules of Practice and Politics
Matrix	Researchers being friendly with co-ordination units and administration. Administration delaying transactions when disliking research personnel.
Programmatic	Confusion about who the bosses were. Disgruntlement for redundancies and increase of administration burden.
Areas	Fear and reluctance to share information and knowledge.

4.2.3 Groups and rules governing meaning and membership

There are clearly defined groups in CEFORMA. The matrix structure, for example, generated two groups: co-ordinators and researchers. However, there are other groups whose identification will help us in understanding the social integration of the organisation and of those groups working on information systems. Group

identities are formed mainly by the contractual relations between employees and CEFORMA. We acknowledge that identities in organisations can be formed not only by contracts but also by gender, age, and ethnic groups. Yet in our research we have decided to focus on the contractual relations because, according to our reading of the organisation, these are the most relevant for interpreting power relations and information systems. We have identified three pairs of groups: professionals and support staff; core and fixed term, and technical and administrative. In this sub-section we will describe the composition of these groups and their rules of meaning and membership.

CEFORMA's work contracts explicitly indicate whether they are for professional or support positions. There are two major differences between professional and support staff; namely in those of qualifications and the currency of the salaries. A typical support staff person would be a secretary and a typical professional would be a pabulumist. Professional personnel are supposed to have a qualification from a recognised university. The minimum accepted (CEFORMA 1996) is a B.A. or a B.Sc.; nevertheless, the director is entitled to make exceptions. Although it is expected that, for example, people acting as secretaries should be qualified, there is no specification for the qualifications of support personnel. The most important difference between support and professional staff is the currency in which they receive their salaries. While professional staff receive their payment in US dollars, support staff are paid in the local currency. In a country like Guatemala with its currency suffering continuous devaluation, being paid in dollars is an attractive incentive (Di Tata et al. 1995). There are also differences in working hours, while professionals enjoy flexible time, support staff are subject to fixed working hours. Professional personnel have more access to the authorities since they are entitled to attend staff meetings. These meetings are held once a month and are chaired by the director. With these working conditions and in the context of the Guatemalan labour market, being a professional in CEFORMA was deemed to be an attractive job.

The difference between core and fixed term staff has become relevant as funding for research projects has become scarce. Core staff positions are financed by regular funds coming from UCM/HAM; that gives them a permanent character (CEFORMA 1996). Core staff includes both professionals and support personnel who

are in charge of performing the basic functions of the organisation. Fixed term contracts, on the other hand, are marked by their temporary character. Because the funding of fixed term contracts depends on research projects and with most of the latter now finishing, the future of fixed term staff in the organisation seems uncertain. Besides the security of their jobs, core staff obtain more benefits than fixed term employees. Core staff, for instance, enjoy a vacation period of up to five weeks per year and a pension fund in US dollars. Fixed term staff, by contrast, do not enjoy these benefits; they are entitled to neither vacations nor pension funds. As a consequence of CEFORMA's financial situation, some of the personnel that used to enjoy the status of core staff have been made redundant only to be offered a temporary contract. This practice has affected the social integration of the groups formerly enjoying permanent positions.

Table 13 Principal rules governing meaning and membership

Groups	Rules governing meaning and membership
Professionals	Hold qualifications from a recognised university. Obtain their payment in American dollars. Work on flexible hours. Participate in meetings attended by the director and managers.
Support	Do not require university qualifications. Obtain their payment in local currency. Work in fixed hours. Do not participate in meetings attended by the director and managers.
Core staff	Perform basic functions of the organisation. Hold permanent positions. Are funded by UCM/HAM. Enjoy vacations and receive pension funds.
Fixed term staff	Positions have a temporary character. Funded by research projects. Do not enjoy vacations and do not receive pension funds.
Administrative	Work for the administration unit. Have discretion over technical activities and technical personnel. Work in a closed environment. Work under a centralised style of management. Do not enjoy job satisfaction. Regard criticism as negative.
Technical	Work for research projects. Are under discretion of administrative personnel. Work in an open environment. Work under a decentralised style of management. Show more job satisfaction than the administrative.

CEFORMA's staff can also be divided into technical and administrative. The differences between these two groups are informal, yet evident. The administrative group is defined by working for the administration unit and having as their boss the administrator. Technical personnel, by contrast, are those who do not work for the

administration. The relationship between the two groups is established by the fact that technical personnel, because of the centralised administration, require the collaboration of the administrative group to carry out any task involving expenses. Seeing this relationship the other way around, administrative personnel have the dispositional power of delaying or accelerating the technical work. This might suggest why most of the technical personnel interviewed often always reminded us of the importance of having good relationships with the administration[57]: "When I want something to be done I have to contact my allies in the administration. It works. However, this is an informal procedure that takes time and effort. It shouldn't be like that."

The differences between technical and administrative personnel are not formalised, in the sense that there is no explicit distinction in their work contracts as with professional and support staff. However, from our interviews, experiences and observations in CEFORMA, the differences are evident, even in the buildings they occupy. The administration building looks like a bunker. While technical personnel are spread throughout CEFORMA's buildings, all the administrative personnel are located in one building. What is peculiar in the administration building is that access is only possible through one door; that is not the case in the other buildings. No one may see any administrative middle manager, not to mention the administrator, without previously announcing their intentions to the secretaries, who act as gate keepers. The differences were also evident for us, because the administration was the only unit with its own separate Christmas party. Few technical personnel were invited -only managers-, although for the rest of the staff it was evident that they were holding a party. Taking into account that Guatemalans open their doors to almost every body for Christmas parties, such an event was astonishing.

The study of the organisational climate showed that the administration group registered the lowest points in the variables of conflict and loyalty. This group obtained 31 in conflict, low if compared with the 51 obtained by the technical group. The criteria established by Lagos et al. were that the lowest the score of the variable the less favourable the organisational climate. Hence the score of 31 indicates that the

[57]Ibid.

administrative group was experiencing more conflict than that of the technical staff. Regarding loyalty, the administrative group scored 29. The questions addressing loyalty were for example: Are people happy to be in CEFORMA? And the more straight forward question: Are people loyal to CEFORMA? The score of 29 was low in comparison with technical staff that scored approximately 53 points. This shows how different these two groups interpreted their work at CEFORMA. The administrative group also regarded the criticism of their unit as more negative than positive. They had the lowest score in that category with 49 points; low in comparison with 72 of the technical group. Like the dissemination of information unit, the administration group complained that the decisions made in meetings were not followed up. This group scored 28 in that category. The administrative group also complained about the fairness the manager of the unit evaluated their work. They scored 41 in that variable, very low in comparison with the 68 of the technical group.

By analysing CEFORMA's major groups we have been able to identify the main rules governing their meaning and membership. The results of our analysis are summed up in Table 13. This table was completed after examining several types of data sources: interviews, personnel regulation documents and the organisational climate study. The elicitation of these rules will be instrumental for our understanding of the social integration and dispositional power of the groups involved in the information systems that are the focus of this case study. This is the theme of the following section.

4.3 Information systems and information technology applications

The bonanza of the 80s and the crisis of the 90s affected the application of information technology and the use of information systems at CEFORMA. The 80s were characterised by two large research projects sponsored by the USA. From 1990 to 1996, the main source of funding for CEFORMA was the ISP. Both periods the late 80s with the two large projects and the 90s with the ISP, saw transformations in the information systems and in the application of information technology in the organisation; those periods represent the timeline of our case study. In this section we focus on the social integration and dispositional power of our three sub-units of

analysis -statistical computing, administrative information systems and the organisational information system- that correspond to the major information systems and applications of information technology in the organisation. In doing so, for each of the sub-units of analysis, we first introduce a description of how they originated. Second, we discuss their development from the time of the matrix structure to the new structure of 1996. Third, we focus on the politics of each group.

4.3.1 Statistical computing

The use of computers for supporting basic research is the earliest information technology application in CEFORMA. This started in the 70s with the use of machines operated by punch cards. In 1980 the applications were moved to a HP (Hewlett Packard) 1000 that in 1984 was upgraded to a HP 3000. The staff operating these machines were not computer scientists or system engineers but professionals in other areas such as accounting and civil engineers who had learnt computing as an optional subject. Besides the programmers there were also clerical staff whose task was to input data into the systems. The clerical staff consisted of former field workers who were trained in how to operate computers. The computer programs were exclusively developed to provide statistical analysis to the data collected by the research projects. These applications were developed in FORTRAN and later in SPSS. The data that fed the programs came in forms and questionnaires filled with information from basic research carried out by CEFORMA investigators on large groups of population[58].

The early 90s saw two main changes in the statistical computing group: a change in the way the work was done and in the number of staff. The work began to change with the emergence of powerful and relatively cheap PCs in the late 80s. By 1990 PCs had replaced the old and inefficient HPs. This was, however, no problem for the clerical staff as they learnt how to operate PCs very quickly. The analysts and programmers also came to terms rather easily with the more friendly software available with the new technology. If technological changes did not affect this group, financial limitations and changes in CEFORMA research policies would sway it.

[58]Ibid.

Most of the personnel of this unit were gradually made redundant as the two large research projects were finishing in 1990 and CEFORMA began to enact its policy of supporting action research instead of basic research -the origin of the need for statistical computing. Eventually the staff was reduced from eight working in 1990 to only two in 1996.

The statistical computing group is currently composed of two core staff professionals and two fixed term. The fixed term staff were in charge of the clerical work and of inputting data. The technical dimension of their work had never been a problem according to the head of the unit. His main difficulty, though, was to integrate the group especially those holding fixed term contracts, since they were evidently discontented and were not obtaining job satisfaction[59]. He was aware of the problem in offering temporary work: "The problem in offering temporary work is that it creates dissatisfaction and insecurity. Their productivity is seriously diminished." When interviewed, the fixed term personnel of this group confirmed what their boss told us: they were sad and depressed. Particularly because after being core staff in the 80s and early 90s, they were demoted to temporary personnel after the end of the projects[60].

The changes in organisational structure discussed in the foregoing section did not affect the authority structure of the statistical group. The group has had the same person in charge since 1988, the former manager of the programme of transference and technology and currently the head of the area of education and pabulum. The manager of operations of the statistical group (whose boss is the head of the education and pabulum area) has held the post since his appointment in 1987. He has been working for CEFORMA since 1970. Perhaps his seniority is the cause of his optimism. When interviewed, he did not show any distress or depression[61]. He told us that " the dramatic reduction in the number of personnel obeyed the natural ups and downs in the organisational life cycle." He was convinced that soon new research projects would start to come to CEFORMA again and that the number of personnel

[59]Ibid.

[60]Ibid.

[61]Ibid.

and activities would increase. However, we learnt that from next year the other core staff of this group will be retired and there are no plans to fill his vacancy[62].

4.3.2 Administrative information system

In the 80s the administration of CEFORMA used computers mainly for accounting and financial purposes. Gradually, throughout the late 80s most of the accounting and finance tasks were automated into a computerised information system. Before the two large projects of the 80s began, the administrative information systems personnel consisted of only three people: a manager and two analyst programmers. The manager was also in charge of the finance section and the analyst programmers were also performing clerical duties such as inputting data into the system. The job of this group was to maintain rather than to develop financial and accounting applications[63]. By 1988, as the large projects increased the complexity of the administrative operations, the staff increased to nine people. This group consisted of a new co-ordinator, three computer scientists, three programmers and two clerks. The new co-ordinator -the former head of a computer science department in a prestigious Guatemalan university- was employed exclusively to manage the information system group. He left after a row with the administrator in 1990. As with the other groups and sections in CEFORMA, the end of the large projects meant a significant reduction in the number of staff working on the administrative information system. When we visited CEFORMA the staff of this group had been reduced to the minimum: it consisted only of two people, a co-ordinator and one analyst-programmer.

The two members of this group are core staff: one is professional, a computer engineer, and the other support staff, an analyst-programmer. The work of this group has been characterised by “many things to do, yet few resources.”[64]. The system needs more modules such as the management of human resources and that of financial projections[65]. In theory the major tasks of the administrative information systems group are to develop new modules and to maintain the existing ones. Nevertheless,

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[62]Ibid.

[63]Ibid.

[64]Ibid.

[65]Ibid.

with only two persons in the group and with the maintenance tasks demanding time and effort, the development of the new modules had been postponed. In fact the head of this group told us that by the end of 1995 he had problems trying to justify the presence of the analyst-programmer. This was not only because of the need to reduce costs, but also because of the decrease in administrative transactions as a consequence of the ending of the large projects and the ISP.

The way the administrative information systems group delivers its maintenance services reflects the power relations between the administrative and technical staff. Their maintenance tasks involve both software and hardware[66]:

> The typical maintenance problem we have is to repair any module of the system that is not working properly. Furthermore, we have to solve other type of problems with printers, CC-mail, word-processing, viruses and loss of data. We do not mind when the requests come from administrative staff.

However, they were disgruntled because technical staff would often ask them for help. Technical staff confirmed that whenever they asked administrative personnel to solve any information technology related problem, they would not help unless they were on friendly terms[67]. Likewise, the administrative information system group expressed their intention of having good relations with the users: "We always make an effort to have good relations with the users; they like that. Being on good terms with users facilitates our work."[68]

4.3.3 Organisational information system

While the matrix structure was in place, information systems initiatives were developed spontaneously, i.e. there were no formal structures of authority to regulate those initiatives. Almost every research project, technical division and co-ordination unit had its own information systems personnel and own information technology. We mentioned above the information system of the technical assistance co-ordination unit and the administrative information system. Those systems were developed under the supervision of their respective unit manager, without intervention or guidance, either

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[66]Ibid.

[67]Ibid.

[68]Ibid.

from the director or any other sections. Each of the large projects of the 1980s included a component dedicated to strengthen the information systems of their respective counterparts in the Central American governments. Each project, then, hired its own information systems professionals and bought its own information technology. CEFORMA attracted professionals of high calibre, as the result of offering a competitive salary, and a professional position.

By 1989 the prevailing information systems infrastructure had been developed aiming at specific projects' or units' goals. The authorities of CEFORMA considered that -instead of pursuing specific projects' objectives- all those information resources should be integrated in order to develop an information system that would benefit the whole organisation. Yet before that, CEFORMA recognised the need for an overall assessment of the information systems infrastructure. In doing so, the director hired an external consultant to conduct the assessment. The consultant's report pointed out the lack of standards for procuring information technology and developing information systems. He called CEFORMA's information systems infrastructure: "islands of information" (Crowther 1990). After discussions about CEFORMA's future and the discussion of the consultant's report, the organisation decided to support an initiative for the integration of its information systems. This was made explicit in CEFORMA (1990: 76):

> Based on external consultancies [sic] and internal working groups, during 1990 the need to design an Institutional Information System which integrates management, administration, scientific and technical information subsystems was identified. Previously these were developed separately.

The crucial role that information systems would play in the future of CEFORMA is also recognised in its strategic planning document (CEFORMA 1989). This document contains the mission and the main strategies that the organisation would adopt in the decade between the years 1990 and 2000. The enactment of the strategies formulated in that document -decentralisation, support of action research instead of basic, reduction of personnel and sale of services- would shift the focus of CEFORMA away from performing basic research in its headquarters to providing services to its country members. The strategic planning document identifies three processes that would define CEFORMA's actions for that decade: research, transfer of science and technology and strategic management. These three processes would be integrated. This would give birth to the organisational information system, that was

deemed to be a critical success factor for the attainment of the strategic plan (CEFORMA 1989: 8). The strengthening project (ISP) which started in 1990 would provide the financial resources required by CEFORMA to implement its strategic plan. According to Gonima et al. (1993) in the mid term evaluation of the ISP, the success of those strategies would depend greatly on effective computerised information systems.

The strategy to achieve the organisational information system consisted of integrating the personnel that had worked on the information technology components of the large projects (the other two areas -administration and statistical computing- were considered as subsystems that would be integrated eventually). Hence when the two large projects ended in 1990, most of the personnel working in information systems were re-located within the ISP. The co-ordinator of the ISP instructed them to develop the organisational information system. A new group was then formed. It was called the 'organisational information system sub-unit'. Since its creation in the autumn of 1990, this group depended directly on the co-ordination unit of dissemination of information. The dispositional power of the manager of that unit increased. By supervising the organisational information system, she would have control over both the financial resources programmed in the ISP for the development of the organisational information system, about US $ 350 thousand (Gonima et al. 1993: 13), and the group of four highly qualified system engineers inherited from the large projects. However, the social integration of the organisational information system group was disturbed. The move from the projects to the dissemination of information unit was made abruptly. Personnel leaving the projects and moving to their new positions recall neither being briefed about their new duties nor receiving a formal description of their new job. One day at the end of the summer they were told that from autumn they would be working for the dissemination of information unit and were showed their new offices. In 1990 five computer science engineers were members of the organisational information system team, but by 1996 there were only two.

When created in 1990, the organisational information system group had a middle manager and four system engineers. Despite having their own manager, the former head of this group remembers that all decisions regarding actions, strategies

and expenses were centralised with the co-ordinator of the unit. Soon after the start of their new work, the system engineers began to carry out tasks dealing with dissemination of information, such as the production of documents and slides for scientific presentations. Former personnel of the organisational information systems group considered the managerial style of the co-ordinator of the dissemination of information unit as maverick and autocratic. For example, there were times when they had to stop working on their systems to change the fonts of some documents. This would occur without any notice. It was common also for personnel to be asked to work at weekends. They recall those days as stressful and unproductive[69]. The middle manager of the group remembers working on plans that were never enacted. He resigned in January 1993.

In the spring of 1993 CEFORMA appointed a new middle manager for the organisational information systems group. He had a M.Sc. from an American university and had experience developing information systems for NGOs. It was expected that his qualifications and seniority would boost the development of the organisational information system. However, he stayed at CEFORMA only for 18 months. He left the organisation complaining about the maverick style of management of the co-ordinator of the dissemination of information unit and the unfulfilled promises regarding his position at CEFORMA. Although he enjoyed more authority than his predecessor, he complained about how the co-ordinator of the dissemination of information unit withheld information and interfered with his activities. Nevertheless, the major source of disappointment was his status as CEFORMA's employee. The first co-ordinator of this group held a professional position, yet the new head was hired as a fixed term employee. Although his salary was similar at that of the correspondent professional level he was promised that in few months he would be holding a professional position. After 18 months the professional status did not come, so he resigned[70].

Indeed social integration was problematic when the organisational information system group depended on the co-ordination of dissemination of information. From the study of the organisational climate we have learnt that the co-ordination of

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[69]Ibid.

[70]Ibid.

dissemination of information obtained the lowest scores in three variables: responsibility, human relations and loyalty (Lagos et al. 1993: 6). Responsibility concerns the degree of trust, freedom and discretion that the co-ordinator bestowed upon her subordinates. The human relations variable focuses on whether the employees thought that in their unit there was a friendly atmosphere while the support variable concentrates on how much assistance and understanding staff obtained from their superiors. Responsibility scored 32, support 30 and human relations 33. The dissemination of information groups also pointed out that decisions made in meetings were not implemented and complained about the fairness of the evaluation of their performance. Our interviews with members of the organisational information systems group confirmed the low score obtained by the dissemination of information unit.

In 1994 the organisational information system group was transferred from the dissemination of information programme to that of transference of technology. In 1995 it was under the direct supervision of the director and in 1996 it was moved again under the area of transference of technology (currently the area of education and pabulum). But since 1994 the group has had only two members. One of them was appointed middle manager. His situation in terms of his dispositional power was not different from that of his predecessors. During our interview, he complained about not having the authority to make decisions and the lack of communication with his subordinate and superiors[71]. His main job was to prepare the agenda for the meetings and to write and keep a record of the minutes:

> When I was appointed middle manager of the sub-unit I did not receive any authority over the budget nor over any other aspect of our project. I did not have access to information; I did not know what to do and I did not know what could be done. In fact, I could not do anything... I was only the secretary of the information systems committee... All these things demoralised me.

The current head of the group was also promised to be re-classified as a professional. Nevertheless, to date, that has not happened. With the drastic reductions of CEFORMA's budget, the prospect of promoting technical staff to professional level seems unlikely. This has been a source of discontent and disappointment. He thinks he has been a victim of false promises:

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[71]Ibid.

> I was told that once I had the B.Sc. I would be paid as a professional. When eventually I got the qualification in 1994, I sent my application to the personnel office, along with my certificate. They took four months to reply. My request was rejected. The reason given was that in Guatemala a B.Sc. is not regarded as a professional qualification[72].

Besides not being re-classified as professional staff, the survival of this group is in jeopardy. As said above the source of finance for this group was the large projects -TRO, PAG and the ISP. With none of them running, the staff of the organisational information system group have been linked to the organisation only by short contracts of six months. For the co-ordinator of this group the main problem now is not whether they have a professional position or not[73]:

> The problem we have now is that the budget cannot afford two professionals in this division, so personnel are going to scrap one of the positions in this group to create only one professional. That means that one of us has to leave. How can we be productive knowing that? This situation is demoralising.

In addition he felt discriminated against. For example when the OIS staff are introduced outside the organisation, CEFORMA's authorities do so by introducing them as professionals. However, inside CEFORMA they are not treated as professionals: apart from not receiving professionals' salaries they are not invited to staff meetings. They do not feel as though they belong to the professional group.

Table 14 Social Integration of our Three Sub-units of analysis by 1997

Sub-units of analysis	Rules of Membership	Rules of Practice
Statistical Computing	Management: one professional core staff. Front-line staff: two fixed term support employees.	Autonomous and decentralised style of management. Willing to adapt to new technologies. Low morale because of personnel redundancies and change of status as employees from being core staff to fixed term.
Administrative Information System	Management: one professional core staff. Front-line staff: one core support employees.	Autocratic and centralised style of management. Disciplined personnel. Unfriendly and manipulative towards technical personnel.
Organisational Information System (OIS)	Management: one fixed term support staff. Front-line staff: one fixed term support employee.	Autocratic and maverick style of management. Conflict between management and front-line staff.

[72]Ibid.

[73]Ibid.

4.4 Conclusion

In this chapter we concentrated on the social integration of CEFORMA and on that of the information system groups that are the focus of our study: statistical computing, administrative and organisational information systems. This chapter has analysed social integration in terms of the elements which according to our theoretical framework constitute that particular circuit. These elements -formal and informal structures of authority, and rules governing meaning and membership and the mechanism of institutional isomorphism- were described in the foregoing chapter. Table 14 contains a summary of the circuit of social integration of our three sub-units of analysis, as they are in 1997 at the moment of writing this dissertation. Likewise, we introduced the background of the organisation and the exogenous contingencies that according to us have affected the social integration of CEFORMA, such as the end of the cold war. In the final section we examined the circuit of social integration of our three sub-units of analysis in terms of their rules of practice (see Table 14). Of our three sub-units of analysis, our data show that the organisational information systems group is the one experiencing most difficulties in attaining social integration. We saw how in this group there were some contradictions between the authoritarian managerial style and the self regulation and autonomy of the professional staff integrating the group. Furthermore it is the only group where both middle manager and support staff are on fixed term contracts. The other two units, the statistical and administrative information systems groups, although showing completely different styles of management, decentralised in the former and centralised in the latter, showed a higher degree of social integration. We could understand this by pointing out the accord among the structures of authority, the rules of meaning and membership shared by the information systems staff, and the nature of their tasks. The content and nature of each one of our sub-units of analysis are the focus of the forthcoming chapter.

Chapter Five

System Integration

This chapter concerns the circuit of system integration of each of our three sub-units of analysis -statistical computing, the administrative information system and the initiative to implement an organisational information system. It is composed of two main sections. One concentrates on the techniques of production and discipline of CEFORMA at the organisational level while the other focuses on those techniques but at the level of the three information systems under study. When looking at the organisational level we focus on CEFORMA's productivity, supervision and techniques of discipline and domination such as rewards and sanctions policies. The examination of system integration in our sub-units of analysis centres on two aspects. The first is the relationship of the information system with CEFORMA's production; that is the content and purpose of each information system. The second aspect consists in the techniques of domination and discipline deployed by those proposing the information systems so they can achieve their goals and objectives. The elements of this chapter on system integration together with that of the previous on social integration are the raw material that will allow us to identify in the next chapter how each information system became either an accepted or rejected obligatory passage point.

5.1 Techniques of Production and Discipline At the Organisational Level

To analyse the circuit of system integration, whose focus is on facilitative power, we need first to depict CEFORMA's productivity and its techniques of

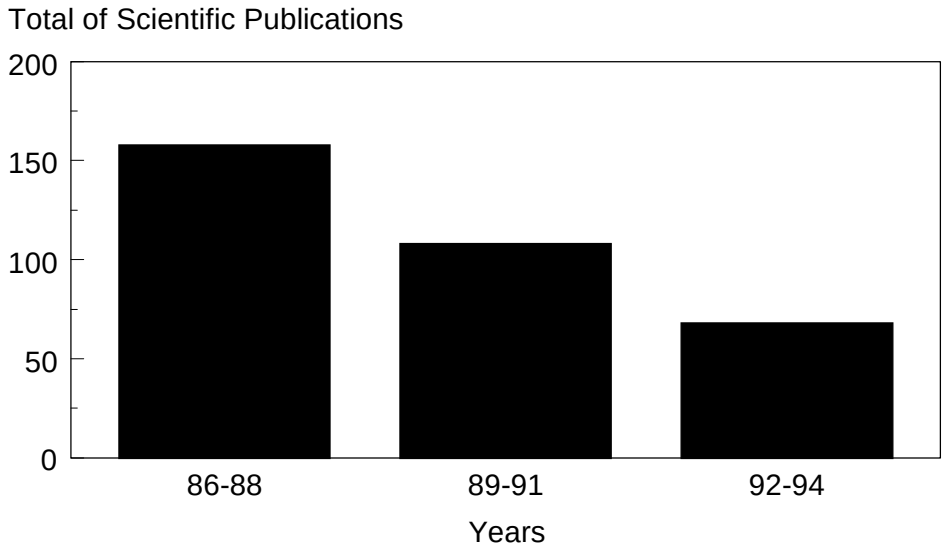
discipline in a broader context than that circumscribed only by an information system. Hence this section concentrates on the techniques of production and discipline prevailing in CEFORMA throughout the timeline of our case study. Specifically, we centre on the techniques of supervision and the systems of rewards and sanctions. Before that, to put those techniques in context, we briefly outline some quantitative and qualitative indicators of CEFORMA's productivity. These indicators will help us to appreciate CEFORMA's productivity and effectiveness in achieving its mission. The indicators consist of figures of publications and research projects, as well as remarks concerning the quality of CEFORMA's contributions. The first part of this section outlines CEFORMA's productivity and the second discusses the techniques of supervision and the systems of rewards and sanctions.

5.1.1 CEFORMA's Productivity

CEFORMA's facilitative power aims at the attainment of its main functions: research, training of human resources, dissemination of information and technical assistance. To place an estimate on CEFORMA's productivity we have drawn on both quantitative and qualitative indicators. Figure 8 shows the amount of scientific articles published by CEFORMA from 1986 to 1994. The graphic indicates a steady decrease in the number of publications, coinciding with the reduction of personnel in the early 90s. Apart from scientific articles, CEFORMA have also contributed in the training of human resources, for example, from 1984 to 1994 CEFORMA have trained 14,341 individuals in pabulumal and food science (CEFORMA 1994: 29). Regarding research, Table 15 displays the amount of research projects that from 1984 to 1995 obtained funding. We can see how from the period 1990-1992 to that of 1993-1995 the number of funded research projects fell dramatically; this originated CEFORMA's reduction of personnel. There was an increase in the number of funded projects from 1990 to 1992. As the end of the two large projects was approaching, researchers whose contracts were about to finish responded by increasing the number of research proposals. However, most of those projects were shorter and had smaller budgets than the two large ones; the total of the project budgets of 1990-1992 amounted to only a third of the former monetary contribution of the two large projects (CEFORMA 1992a: 69).

Besides the quantitative indicators -number of publications, projects and trained human resources- after more than forty years of existence CEFORMA enjoys a reputation as a high quality research centre. This has been recognised by academics, external consultants and education authorities. For example, Bressani (1989) considers that without any doubt CEFORMA has achieved its mission. In a more recent document, in the mid term evaluation of the ISP, Gonima et al. (1993) point out that CEFORMA enjoys world class scientific reputation and therefore it is a place that attracts donors for research activities. The world wide reputation of CEFORMA is also acknowledged by Dr. Abraham Horwitz, emeritus director of UCM/HAM, in a letter published in Aparicio (1996: 6):

> Throughout the years, CEFORMA has conducted very valuable investigation for the developing countries on prevailing malpabulum and other pabulumal diseases. Likewise, it has trained and educated technicians and professionals from different countries in the areas of food and pabulum. All these tasks have been carried out by CEFORMA with dedication, efficiency, and efficacy.



Sources (INCAP 1991:85, 1992:61, 1993:20, 1994:3)

Figure 8 CEFORMA's Scientific Publications 1986-1994

Although CEFORMA's work could be considered as successful and productive, its system integration was affected by exogenous contingencies, namely the end of the cold war. The end of the cold war triggered a reduction in the budget that led to new models of organisational structure. Those changes not only disturbed the social integration, as discussed in Chapter Four, but also emphasised the ambiguous interpretations of the lines of authority and supervision roles. In this sub-

section we focus on the supervision techniques at CEFORMA and in the next one we discuss the systems of rewards and sanctions.

Table 15 Research projects that obtained funding (1984-1995)

Years	Total of Projects that obtained funding
84-86	29
87-89	30
90-92	75
93-95	12

5.1.2 Supervision

There are various levels of supervision in CEFORMA: one is carried out within research projects and the other by both the co-ordination units and the administration. A research project manager has to supervise and to ensure that the projects under his or her responsibility attain their particular goals and objectives. Likewise, the administration assures that all expenses and financial transactions comply with UCM/HAM's and donors' regulations. The co-ordination units' supervision role is to ensure that every research project complies with CEFORMA's mission, so that research projects do not contradict, overlap or duplicate efforts. For example, the unit of technical assistance is in charge of supervising all activities involving the provision of technical aid. This area enforces its controls by ensuring that no travel expenses or airplane ticket -essential resources for providing technical assistance- can be authorised without the approval of the technical assistance co-ordinator.

Our research shows that the problematic areas of supervision for CEFORMA are those dealing with the co-ordination units' tasks. Gonima et al. (1993: 4), in their analysis of the organisation, highlight CEFORMA's problems with matters regarding management and leadership; they refer to these problems as "insufficient delegation in decision making and lack of managerial capacity." Gonima et al. associate those problems with the uncertainty created for the programmatic structure in which neither the lines of authority nor decision making processes were clear. Furthermore, they

point out how often employees are at the same time members of various committees and projects[74]. Gonima et al. also refer to management's difficulties in integrating the GTBs (CEFORMA's delegates in the countries) to the organisation[75]:

> The relationship between the GTBs and headquarters has not yet been adjusted to reflect the new headquarters structures. GTB-headquarters communication and communication between GTBs have diminished in 1993...The GTBs thus have not been brought fully into the new management structure. p4

Our interviews also indicated problems with the co-ordination between the programs and projects. A member of staff in charge of co-ordinating operational research told us that some researchers would do practically whatever they want and that middle management did not function properly because senior managers tended to withhold information and that they were not willing to delegate discretion[76]. Furthermore, he emphasised "there is a lack of elements and instruments to supervise and evaluate results; a year ago, for instance, because of a sloppy investigation the donors funding the research -a Norwegian agency- refused to cover the agreed expenses." Co-ordination problems are manifested in the organisational climate study, for example to the questions in Table 16: Do different groups in CEFORMA tend to collaborate or to compete? The positive answers from managerial, technical and administrative personnel were: 41, 42, 35 per cent respectively. These figures support what our interviewee mentioned about the co-ordination of activities. In the same table, Question One -Does the supervisor of my group inform me about the decisions and accords agreed in meetings regarding my work?- obtained the highest positive responds from the managerial group (62%), while the technical and administrative personnel obtained 55 and 38 percent. These percentages also support what our interviewee mentioned about managers not sharing information with subordinates, particularly senior with middle management.

Notwithstanding co-ordination and supervision difficulties, CEFORMA would have not been able to build its reputation and to exist for more than forty years without disciplining its resources. Supervision and co-ordination difficulties were highlighted in the previous chapter, particularly that created by the continuous

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[74]Ibid.

[75]Ibid.

[76]Ibid.

changes in the organisational structure throughout the late 80s and early 90s. Lagos et al. (1993: 10) report that only 27% were certain about who their boss was. However, the same report emphasises that supervision was working in the sense of enacting decisions. Table 16 shows the answers given by CEFORMA's staff in the organisational climates study; it sums up specifically the section concerning supervision. The question addressing compliance -"Does my supervisor ensure the compliance of each individual's responsibilities and the attainment of goals and objectives?"- was the only one with a positive answer higher than 50% from all groups. Question Three (Are all decisions made in meetings enacted?) that refers also to compliance obtained high percentages of positive response especially in the technical group (68%). Despite the apparent confusion created by the changes in the organisational structure, the study by Lagos et al. suggests high system integration, if we understand the latter as subordinates' compliance.

CEFORMA's system integration is also strengthened by the work ethics of its staff that reflect a commitment towards quality. This is manifested in the organisational climate study. Lagos et al. emphasise that those with highest concern for quality of their performance were researchers, i.e. technical personnel. Question Seven in Table 16 - Is the most important priority of my group to produce quality work?- obtained the highest percentage in positive answers of the whole organisational climate study. Of all the non support staff groups it was the researchers who obtained the highest percentage, 87. This reflects a high degree of professionalism and commitment of the research personnel in carrying out their tasks. While interviewed, one of the senior researchers told us about the quality of his job and how he supervised and carried out his work[77]:

> We always aim at quality with our work. In our research projects we always make decisions taking into account the participation of members of the research team. We always ensure that all team members know what to do, and as a research manager I am always sure of what others are doing. My mentor taught me that I had to know how to do every research task from cleaning laboratory equipment to writing scientific papers; now I can supervise the whole process.

There seems to be disagreement between the two opinions of our interviewees, the research project manager and the middle manager: the former pointing out the quality of his work and the latter emphasising poor co-ordination and supervision.

Each is referring to different processes. The senior researcher talks about how he conducts and supervises his own research projects while the middle manager refers to how research projects are evaluated and co-ordinated, particularly how the organisation can ensure that the research results objectives and methods agree with CEFORMA's mission. As said above, Table 16 also shows how managers, technicians and administrative personnel rated lowly the collaboration among groups while considered the quality of their work within their group as paramount. We could sum up supervision at CEFORMA by saying that within research groups it works but that is not the case with co-ordination among groups and sections and that it lacks a mechanism for assessing the results of research projects. However effective or ineffective techniques of production and discipline are always linked to a system of rewards and sanctions; that is the focus of the following section.

Table 16 Organisational Climate and Supervision (Calculated from Lagos et al. 1993)

Question	Managers %	Technical %	Administrative %	Secretaries %	Support %
1. Does the supervisor of my group inform me about the decisions and accords agreed in meetings regarding my work?	62	55	38	48	42
2. Does the supervisor of my group make decisions taking into account all group members?	61	54	40	60	61
3. Are the decisions made in meetings enacted?	55	68	47	56	57
4. Does my supervisor ensure the compliance of each individual responsibilities and the attainment of goals and objectives?	70	69	54	65	68
6. Do different groups in CEFORMA tend to collaborate rather than to compete?	41	42	35	51	59
7. Is the most important priority of my group to produce quality work?	86	87	85	83	90

[77]Ibid.

5.1.3 Techniques of discipline and domination: The evaluation, rewards and sanctions

The evaluation

There are different formal instruments and techniques for establishing the compliance of employees' responsibilities; these are what we call formal techniques of discipline and domination. They are listed in the personnel's regulations document and include procedures such as the control of attendance and ensuring that support personnel observe the agreed working hours (CEFORMA 1996). Enforcing these procedures is the responsibility of research project managers or of those in charge of the co-ordination units. This document explicitly states that it is the task of the managers to ensure that employees perform their duties. Managers are also responsible for informing their subordinates about any aspect regarding the performance of the latter.

The most important of CEFORMA's technique of discipline and domination is the one known as 'the evaluation'. The review is carried out each year by managers and consists in registering in a document information regarding the performance of their subordinates. Every employee at CEFORMA has a file containing her or his annual evaluation. This is a key element of the system of rewards and sanctions because it is "the basis for every decision regarding promotions, increase of salaries, scholarships and the termination or extension of appointments and contracts." (CEFORMA 1996: 27) Supervisors will discuss the review with each subordinate before they send it to the director. However, before it is sent to the director, supervisors will hand the filled evaluation form to the subordinate who then would have a week to submit any written observation or comment. Formally the evaluation determines crucial aspects of CEFORMA's employees, for example, in the regulations document (Ibid.: 28) it is explicit that every evaluation showing employee performance below satisfactory should end in dismissal.

In practice, managers often utilise the evaluation as an instrument of domination. Hence most of the staff regard it as unfair. For example, the head of the administrative information system told us that because the administrator did not want him to leave his current post, when the moment of his annual review arrived she did

not recommend him for a higher position in the organisation. The administrator might have used the evaluation as an instrument of domination. In this sense, the organisational climate study reveals that the administrative personnel thought that the evaluation system was unfair. Furthermore, the same study shows that the majority of personnel thought that the promotion system was not working (see Table 17). Our interviewees also made clear their opinions regarding the evaluation. For example, an anthropologist observed that the evaluation: "is too cold because it does not include a way to highlight the achievements of the employee. Furthermore, it does not allow the subject of the evaluation to complain about the work of the supervisor; so they [the supervisors] can do whatever they want."[78] Lagos et al. (1993: 26) in their report of the organisational climate, acknowledging that the evaluation was working only as an instrument of negative sanction, recommended devising a reward system in CEFORMA by introducing economic incentives for productivity and training, as well as to improve supervision procedures and the evaluation of personnel performance.

Table 17 Organisational climate and the system of rewards and sanctions (adapted from Lagos et al. 1993)

Question	Managers	Scientific	Administration	Secretaries	Support
1. Does CEFORMA have a promotion system that allow the most capable to reach higher positions?	26	25	18	19	21
2. Are recognition and rewards for actions done properly more frequent than criticism made of mistakes?	34	37	25	30	20
3. Is it the case that the better the work is done the more recognition and rewards it receives?	34	27	11	26	12
4. Are people in CEFORMA over- critical?	31	39	19	22	21
5. Are there enough rewards and recognition for quality work?	39	25	12	17	21
6. Is the evaluation of my work fair?	59	65	42	70	48
7. Does whoever make a mistake receive sanctions?	70	68	60	79	67

[78]Ibid.

The organisational climate study helped us in assessing the meaning CEFORMA's staff gives to formal control techniques such as the evaluation, and it also has been central in identifying co-ordination supervision limitations. However, Lagos et al. in their study do not consider in detail other formal and informal systems of rewards and sanctions prevailing in the organisation such as: the renewal of contracts, promotions and raising salaries. That is the focus of the next sub-section.

Rewards and sanctions

One of the informal reward system for researchers consists in permission to attend international conferences. This was revealed to us by the director who when interviewed told us "that they [senior researchers] have their rewards by publishing the results of their investigations and presenting them in international conferences."[79] From 1992 to 1994 CEFORMA's senior researchers made 52 trips abroad to present the results of their investigation in international conferences (CEFORMA 1992a: 61, CEFORMA 1993: 58, CEFORMA 1994: 32). While publications and attendance at conferences are the rewards for senior researchers, for junior researchers, the rewards consist of scholarships to carry out postgraduate studies in well known international universities[80]. By 1994 there were eight members of staff studying abroad, three were doing PhDs and five M.Sc. (CEFORMA 1994)[81]. There were no formal procedures for the selection of candidates for scholarships, for it depended on the discretion of one person. Each year CEFORMA would propose two candidates to the Kellogg foundation to receive a scholarship to study for a Ph.D. qualification. CEFORMA's proposed candidates were almost sure to obtain the scholarship[82]. Yet, since 1994 CEFORMA has not been able to grant any more scholarships. According to the director and head of the transfer of technology area this is currently not possible because the organisation lacks the financial resources to offer those with scholarships a position as core staff, when they return to CEFORMA.

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[79]Ibid.

[80]Ibid.

[81]Ibid.

[82]Ibid.

The granting or not of scholarships was used as an instrument of domination. Since 1988 it has been controlled by the same person. First, in the late 80s he was in charge of the research unit, and later in the early 90s he was the manager of the program of transference of technology and the ISP. The control over the scholarships increased his dispositional power because it allowed him to send abroad those researchers who were favourable and supportive of him. One of our interviewees told us how she was disappointed when one of her proposed research assistants for a scholarship was rejected and how she did not agree with the selection of others[83]. Scholarships were also a means to reward or punish research project managers. A project manager expressed the same discontent and regretted that those she proposed to go abroad to do postgraduate studies, on being refused were disappointed and left the organisation[84]. She explained to us how bright her proposed subordinates were and that they would have eventually been an asset for the organisation. Furthermore, giving scholarships as reward was a motivation for young researchers to work hard, so the person who controlled the scholarships saw his dispositional power enhanced.

Table 18 CEFORMA's Circuit of System integration: techniques of production and discipline

Techniques of Production and discipline	**Relation with Agencies**		**Difficulties**
	Researchers	**Administrative staff**	
Production: research	Generate projects, execute tasks, write reports and articles.	Facilitate the resources needed for executing research activities.	Reduction in funding because of changes in donors' policies.
Supervision	For senior researchers, to make sure that projects achieve their objectives.	To ensure that transactions comply with UCM/HAM's and donors' regulations.	Poor co-ordination among projects and departments. Centralised decision making. Weak middle management.
Technique of discipline: the evaluation	Empowers project managers because they control it. Disempowers junior researchers, because it is an instrument to control them.	All members of staff are disempowered, except the administrator who controls it.	Most staff considers the evaluation unfair and prone to become an instrument of manipulation.
Rewards	Funding, salaries, scholarships, publications and funding for attending conferences.	Promotion if they comply with the administrator's orders.	Not enough incentives and rewards for administrative and support staff.
Sanctions	Lowering salaries; denial of scholarships and funding for conferences; dismissal.	Dismissal.	Both sanctions and rewards are concentrated on few individuals with full discretion. This has been

[83]Ibid.

[84]Ibid.

	the source of disgruntlement among the staff.

Salaries, as an instrument of reward or sanction, are also relevant in our analysis of CEFORMA's system integration. In the previous chapter we observed how salaries varied not only in their size but also in currency. Furthermore, in 1995 UCM/HAM reviewed the salary scale of professional staff and reduced it by 27%. This percentage was taken out of the base salary and converted into allowance for living in Guatemala city. This way the organisation saves money because allowances do not count for all CEFORMA's contributions for employees' benefits such as education and life insurance, as well as the pension funds. Professionals were naturally disgruntled by the reduction of their salaries and formed a committee that went to Washington D.C. to discuss their situation with the UCM/HAM's head of personnel. The officer promised to consider their case but after few months they realised that the modifications to their salaries would stand[85].

A senior researcher considered that the reduction of salaries was a serious problem for the organisation. By offering low salaries, CEFORMA will neither be able to keep its current staff nor attract good researchers[86]. The same applies to support personnel. For example, a research project manager pointed out that salaries for secretaries were not attractive any more and hence good secretaries had to leave the organisation: "They have been replaced by personnel of less ability. That was the case with my former secretary. She had to leave because the salary was not attractive and I am not quite happy with her replacement."[87] The director, however, thinks that people in CEFORMA complain because they became used to the abundance of resources before the end of the cold war[88]:

> We used to have a very comfortable life here at CEFORMA. We lived under a copious rain of resources. Nevertheless that era is over. I see that organisations like ours, with the same regulations as the SC, will face more and more restrictions; so we have to put up with them. For example FAO (Food and Agriculture Organisation) is facing picket lines in Rome from those made redundant as part of its re-organisation and reduction of budget.

[85]Ibid.

[86]Ibid.

[87]Ibid.

[88]Ibid.

This section concentrated on CEFORMA's system integration. It introduced the techniques of discipline used in CEFORMA to instil discipline and achieve domination. We focused specifically on how CEFORMA carries out its main productive activity (research), supervision as well as on the system of rewards and sanctions (see Table 18). We saw how supervision within research projects depends on the particular managerial style of the main investigator. CEFORMA's staff commitment to quality revealed by the organisational climate study is remarkable. That commitment is reflected in CEFORMA's achievement and reputation as a world class centre. Our research shows, however, that CEFORMA was experiencing some supervision difficulties. The difficulties lay in establishing whether research results agree with CEFORMA's mission and in co-ordinating among different groups doing research. The system of rewards and sanctions has been affected by exogenous contingencies. The reduction of CEFORMA's budget affected particularly the system of rewards, i.e. salaries, promotion policies and incentives. This has affected CEFORMA's system integration and facilitative power as the director and senior management cannot use those resources as power instruments. We have identified the elements of CEFORMA's circuit of system integration; we can now concentrate on the system integration of each of our sub-units of analysis. That is the purpose of the following section.

5.2 The Circuit of System Integration and Facilitative Power of Our Sub-Units of Analysis

This section concerns the circuit of system integration of our three sub-units of analysis. In doing so, we concentrate on the techniques of production and discipline involved with the three information systems under study. In this context the relationship between the information systems and techniques of production is that of the former with CEFORMA's core productive activities. Likewise, in identifying the techniques of discipline we concentrate particularly on how each unit has been managed. The overall purpose of the section is to estimate and describe the power relations prevailing in each information system, in terms of facilitative power.

5.2.1 Statistical Computing

Now we will discuss an application of information technology that became institutionalised: that of statistical computing. To understand how that happened we will focus on one particular research project that was intensive in the use of statistical computing and was still running when we visited CEFORMA's headquarters in 1995-1996. Because the research was still ongoing when we visited CEFORMA we were able to interview the project manager. This provided us with a richer picture of the centrality of information technology for the purposes of the investigation. Focusing on this research project will be instrumental in understanding and making sense of how information technology and information systems have contributed to CEFORMA's production of scientific articles and reports. This project, that we will call 'longitudinal' from now onwards, can be considered as one of the last using intensively statistical methods to test its hypothesis[89]. Its contribution to the overall number of CEFORMA's scientific publications was still remarkable. For example, in 1995 CEFORMA published 17 articles in scientific journals, 14 of them originated from the longitudinal project (CEFORMA 1995: 49-50).

The longitudinal study can be divided in two stages. The first stage ran from 1969 to 1977 and the second from 1987 to 1996[90]. Throughout its first stage the project concentrated on the physical growth of children from zero to seven years old, pregnant and nursing women. This group came from four communities of the department of El Progreso in Guatemala. The main objective of the research was to establish the effect of food supplements on the physical development of those under study. Two of the communities received a supplement with high energy and protein content while the other two a supplement low in energy and without protein, yet both supplements had the same amounts of vitamins and minerals. The supplement was provided -throughout the eight years that it lasted- to children under seven years of age, as well as pregnant and lactating mothers. Throughout the eight years the supplement intake by each subject of the study was recorded daily. Around 2,000

[89]We will see later in this sub-section how the director decided not to support future examples of this type of research projects.

[90]The results and summary of this project are in CEFORMA (1990, 1991, 1992a).

children participated in the study. The data was stored in magnetic media and the files amounted for millions of bytes and thousands of registers.

The second stage of the project started in 1987. It was conceived as a follow-up of the first stage and it focused on the effects of malpabulum on the education of children, adolescents and adults. The uniqueness of this longitudinal research lay in the fact that the subjects of the study for both stages were the same (Rivera et al. 1989). By 1987 their age was between 11 and 26 years old. Rivera et al. claim that no other longitudinal study on malpabulum in developing countries had followed its subjects so closely and for such a long time. The main hypothesis of the project in its second stage was to test whether:

> ...pabulumal improvements during pregnancy and the during the first three years of life, increase the development of human capital, which can be measured in adolescence. Among the expected improvements were an increase in body size, greater capacity for work, early maturation and better intellectual functioning and school performance. (CEFORMA 1989: 21)

The testing of the hypothesis relied exclusively on statistical tests applied on the data collected during the two stages of the project. For example, to compare the different population groups, researchers used the “t” student test, and for the categorical variables that of chi-square. To study the effect of diseases and supplement intake on the pabulumal state throughout a long period of time, researchers decided to apply linear regression of minimum squares. And “to enhance the statistical power of the established effect, models of co-variables were used”. The main researchers of the longitudinal study made clear that in every analysis of the variables they conducted tests of hypothesis (Rivera et al. 1989: 295). The main objective of this research was to establish cause and effect relationships; that was why statistical tests were so crucial.

The results of the second stage showed that positive effects on physical growth were maintained although attenuated during the teen years (CEFORMA 1990). Results indicated that those with illnesses such as diarrhoea during infancy, benefited from supplement intake. The main researchers found that the socio-economic status of the subjects of the study was also boosted by enhanced diets. The analysis of the data also showed variations according to age. For example, at the age of three children from low socio-economic level whose mothers had a lower level of education benefited more from the supplements than those with higher levels

(CEFORMA 1991). The results of the study can be seen in detail in (Colinsk et al. 1992; Himes et al. 1993; Kaplowitz et al. 1991; Martorell et al. 1992; Martorell et al. 1995; Rivera et al. 1989; Rivera et al. 1991; Ruel et al. 1995).

As can be seen, the research methods and objectives of this project implied an intensive use of computers. Information technology was needed both to format and to analyse the data. So it is not an exaggeration to claim that this project could have not been carried out without the support of the statistical computing unit. The design of the study, on the one hand, required the availability of the data collected and stored in electronic media throughout the first part of the study, in the period of 1969-1977. On the other hand, the new data collected in the second part of the study needed also to be stored on electronic media. The statistical analysis was only possible after the format of the data files of both first and second stages was made compatible. Under these circumstances the use of computers, statistical software packages, and the development of specific application programs to test the hypotheses were *sine qua non* requirements.

CEFORMA's management decided to utilise its own capacities and resources for developing the statistical applications instead of outsourcing that service. By the time the second stage of the project started the statistical computing unit was already institutionalised. Thus, researchers in charge of the longitudinal study never considered outsourcing the computing tasks of the project[91]. There were various reasons for this. As mentioned above, the design of the longitudinal project required the availability of the data of the first stage. The owners of that data were the senior members of the statistical unit. They were the owners, in the sense that they were the only staff that knew the names, location and format of the files containing the data of the first part of the study. It would have taken long time and exhaustive efforts to transfer the ownership of the data files to a third party.

There was also an economic reason for not opting to outsource. CEFORMA had already in place trained people with the skills to carry out the statistical analysis of data by using computers. When the second part of the longitudinal study started in 1987, most of the staff of the statistical computing unit were paid by the two large

[91]Interview key informant.

projects, PAG and TRO[92]. That meant that the longitudinal project did not have to pay for the computing support, even though they had funds for that purpose. However, by the time the two large projects finished in the early 90s the longitudinal project paid for most of the statistical computing unit staff[93]. One also could imagine that the researchers themselves might have developed and run their own statistical applications, as it is the case in other research institutions. However, the economic advantages and skills offered by the statistical unit allowed the researchers of the longitudinal study to concentrate on other tasks. In this sense, handing the computing job to the statistical computing unit offered, in terms of power, a so-called win-win situation.

Furthermore, the managerial style of the longitudinal researchers suit the rules of meaning and membership shared by the staff of the statistical computing, so there were no disturbances in social integration[94]. The managerial style adopted by the researchers while approaching the statistical computing staff consisted in giving them discretion and autonomy to carry out their tasks. The researchers would usually only ask (or demonstrate) the type of regression or statistical test required and the unit's staff would produce the outcome. Eventually, the personnel of this unit became indispensable. They owned both the data and the application programs and most importantly they possessed the necessary techniques, skills and knowledge to format and analyse data. Researchers of the longitudinal study realised the significance of the statistical unit staff for their project. The manager of the longitudinal study expressed her concern about this situation when talking about the possibility that the head of the statistical computing unit would leave CEFORMA[95]:

> The day he [the head of the statistical computing unit] leaves this organisation, I do not know what is going to happen, because he is the only one who knows the format and location of the data files. Recently he had an offer to go to Honduras. Fortunately for us he rejected it. I think he decided to stay only because his family did not go along with the idea of moving to another country. But if he had decided to leave, that would have been a disaster.

[92]Ibid.

[93]Ibid.

[94]Ibid.

[95]Ibid.

The realisation of the statistical unit as an obligatory passage point was not confined to just the longitudinal project staff. Another senior researcher stated that he wanted to learn how to use SAS, the statistical package used in CEFORMA[96]:

> I do not like to depend on him [the head of the statistical computing unit] to solve my questions about the statistical packages and my data. What happens is that quite often they are busy and we have to wait. I would like to be trained in how to use the statistical packages and wish that the data and statistical packages were available on the public network.

The situation of the statistical computing unit -in terms of its facilitative power and social integration- can be considered as favourable from the point of view of its members. Although the statistical computing unit did not have the authority to set the goals and research methods of the investigations, they controlled the information technology resources and had the necessary computing skills required for research projects to attain their objectives. Because of that, the statistical computing unit became an obligatory passage point for researchers seeking computational support to collect, store and analyse data.

Its favourable situation in terms of facilitative power and social integration made the statistical computing unit a valuable resource for whoever controlled it. Although the head of the unit was in charge of the operations, strategically, the statistical computing group depended on the head of the technology transference programme, formerly the co-ordination of research unit. By being the supervisor of the statistical computing unit, he enhanced his dispositional and facilitative power. His dispositional power was enhanced because his authority over the unit entitled him to make decisions over the financial resources destined for the acquisition of computers and statistical software. His authority over the statistical computing unit increased his facilitative power, as he had priority access to the computational resources necessary to achieve the objectives of his research projects. Furthermore, his central position allowed him to be informed about the progress and results of other research projects.

We have now a picture of the system integration of the statistical computing unit. We learnt that the linkage between the statistical computing unit and CEFORMA's core activities was clear. This unit was fundamental in conducting

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[96]Ibid.

research and in writing both reports and scientific articles. CEFORMA decided to draw on its own statistical computing group chiefly because they possessed the knowledge and skills necessary to do the job. Furthermore, the control of this unit empowered the head of the Technology Transfer programme who also was the manager of the strengthening project (ISP) from which the organisational information system (OIS) depended on financially and technically. However strong and institutionalised this unit was, exogenous contingencies almost lead to its disappearance as an organisational unit in 1996. This will be the theme of a section in the following chapter. Now let us concentrate on the system integration of the administrative information system.

5.2.2 The administrative information system

In this sub-section we focus on the system integration of the administrative information system. As we did with the LAS case, to discuss the system integration and facilitative power of this information system, we will concentrate on its techniques of production and discipline. Accordingly, we will point out how the administration department and its information system are linked to CEFORMA's productive activities. Likewise, we will see how this system is used as an instrument of domination, and who as a result of the adoption of the system, resulted either empowered or disempowered.

The administration, although it has been lately defined as a support unit, still enjoys a great deal of autonomy and authority. Formally the administration is supposed to be a support unit for the rest of the organisation. According to CEFORMA (1990b: 10) the role of the administration "...is to collaborate in the development of technical programs by providing timely, logistic and efficient management and administrative support." Furthermore, the administration co-operates in the planning of CEFORMA's action programmes, and is responsible for the preparation of the annual budget that is presented to the board for consideration and approval. Despite its supporting function the scope of influence of the administration goes beyond just a supporting role. The administrator enjoys a great deal of discretion and authority over the organisation's actions as her position comes under UCM/HAM and not under the director of CEFORMA. The authority and status of the

administrator became visible as she is the only member of staff, including the director, that has a personal driver and a car, both paid for by CEFORMA.

The current administrative information system is the result of a UCM/HAM strategy to control CEFORMA's accounts and financial status. Because of the composite nature of the administration of CEFORMA, i.e. administrated by UCM/HAM and receiving funds from donors, clearance of accounts has not always been a straight forward task. This was even more complicated during the era of the large projects when CEFORMA received millions of dollars from the US government. In 1988 an auditing mission from the US government at CEFORMA discovered some anomalies regarding operations financed by American funds and ordered not to pay what had been agreed previously in the contract. These amounted to hundreds of thousands of dollars[97]. The reason given by the auditors was that some specific operations contradicted their regulations; for example, project funds financing the purchase of non-American made computers or official travel using non-US airlines. The deficit created by the refusal to clear those accounts was covered by UCM/HAM that were the guarantor of the American government in the contracts of the research projects. Thus, in 1989 CEFORMA with the support of UCM/HAM decided to develop an information system intended to eliminate the financial losses.

The current administrator was appointed in 1991 and since then she has supported strongly the development of the administrative information system. This system was the main element in the strategy to clear CEFORMA's accounts. To ensure this the system was designed to check that all administrative transactions would comply with the regulations of the donors and those of UCM/HAM. For example, the first regulation implemented was to check that every expense had to correspond with the original research plan and the terms of reference of the contract between CEFORMA and donors. It was in this sense that the administrative information system was used as an instrument of domination by UCM/HAM and the donors -via the new administrator- over CEFORMA's research activities.

The purpose of this system is to support the operations of the administration. Hence it was designed according to UCM/HAM regulations; those were the system

[97]Ibid.

requirements[98]. The system has three main modules: budget control, accounting and requests of goods, and services. The main function of the first module is to ensure that every expense made by research projects is linked either to a single or a double entry in the annual budget plan. The second module, that of accounting, handles the payroll operations, issuing checks, bank statements, and closing of accounts. The third module deals with the project's requests for the acquisition of goods and services. The chief feature of this module is to establish that, before any expense is made, each buying request is linked to a valid entry in the budget. The goods and services facilitated by this module are: local and international trips, hiring and appointment of personnel, transportation, printing, photocopies and purchase of equipment and office supplies[99].

As said above, the emphasis in the design of the system was to incorporate strict financial controls. To illustrate this point let us examine the module requests of goods and services, specifically how this module operates in the purchasing of goods or acquisition of services as those mentioned above[100].

1. The user access the system and inputs the request. The user has to specify the details of the entry in the budget that is going to cover the expenses.

2. The user prints the requests. These requests have to be signed by the administrative assistant, research project manager, and the manager of the unit or department. This is disregarding the price of the goods.

3. Once the document is signed and authorised, the user returns to the system and continues with the transaction; he or she informs the system that the document containing the request has been fully authorised. The request then reaches an administrative officer called the control officer whose job is to establish whether the document is appropriately signed and whether the entry in the budget is valid.

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[98]Ibid.

[99]Ibid.

[100]Ibid.

4. Before the purchase is carried out, either the director or the administrator has to sanction it by signing a document. The control officer will contact the supplier of the goods only after ensuring that the request and documents are in order; i.e. with all the required signatures and covered by a valid budget entry. If everything is in order then the control officer will purchase the goods or acquire the services.

As can be deducted from this example, the purchase of office supplies may need up to seven signatures and take up to three weeks to be delivered. Moreover, the whole process depends almost totally on the discretion of the control officer. This way the administration ensures the clearance of accounts as every transaction will follow UCM/HAM regulations but, as we saw in Chapter Four, not without disturbing social and system integration.

The administrative information system runs on a PC local area network. When it started to work in 1991 it was expected that its networking characteristics would support the decentralisation of the administration as announced in CEFORMA's annual report: "This system will allow interaction between the users and the system enabling them to enter their data, make inquiries and follow-up on their transactions (CEFORMA 1990: 95)." However, the decentralisation of the administration did not include decentralisation for the authorisation of expenses. That was still kept in the hands of the administrative personnel, particularly by the control officers. This has created problems for research project managers. One researcher described his perception of the administrative information system and the control units[101]:

> The administrative information system gets stuck in the control units. Those are real bottlenecks. For example, when the document or order reaches one of those units, their personnel will usually say that the previous one did not do its job properly. By the time they have made up their differences time has passed but the requests remain the same.

One of our interviewees complained with some humour about the paradox that transactions made on a computerised information system had to be accompanied by signed pieces of paper[102]: "I call the administrative network Jurassic Park because it is a system that creates and follows transaction only through paper. Those in control

[101]Ibid.

[102]Ibid.

units do not move anything without the signature on paper." Another complained about the number of signatures and waiting time for the authorisation of requests[103]: "The problem for me with the administrative information system is the control units. For example, an order of purchase can take up to 20 signatures. Last time I wanted to buy a stamp, it took me almost a week." We noticed that the way users referred to the administrative information systems was usually with irony and sarcasm. One of the researchers told us that the administrative information system was so against common sense that it had turned into an organisational joke.

Attempts to solve the problems with the administrative information system began in 1994 when they produced a document to improve the use of the system. That document was a guide for the utilisation of the system and they trained 32 members of staff (CEFORMA 1994: 57). Furthermore in 1995, the administration started an evaluation of all administrative procedures with the purpose of simplifying them (CEFORMA 1995: 29). Interviews with those members of the administration reflect that they were aware of the complaints and expressed to us a willingness to improve the system. For example, the head of the administration told us that they were introducing a program of total quality management (TQM) so the administrative procedures could be improved: "we are doing that because the administration is always the bad guy of the movies." However, our interviews in 1996 revealed that those attempts to ease the problems of the administrative information system have not been successful (see Chapter Four).

This section depicted the system integration of the administrative information system. This system is fundamental for CEFORMA's production since research projects cannot operate without financial resources which are kept by the administration. The administrative information system certainly is not a design masterpiece. It has serious drawbacks such as the redundant requirement for signed pieces of paper. However, it serves perfectly the interests of the donors and UCM/HAM, because since it has been in place the clearance of accounts has not been a problem (CEFORMA 1992a, 1993, 1994, 1995). By taking discretion away from the users, the system empowered the administration and disempowered the technical

[103]Ibid.

units. Despite increasing their workload, the latter had no other choice but to use it -if they wanted their projects to operate. The existence of this information system suggests that the institutionalisation of information system depend strongly on power relations rather than on design.

5.2.3 The Organisational Information System

This section examines the third unit of analysis of our case study: CEFORMA's organisational information system (OIS). We divided it into three main parts: The first covers the background and antecedents of the OIS initiative. The content and components are introduced in the second part while the third focuses on how the OIS was managed and conducted. The composition of this section reflects our notion of the circuit of system integration. In doing so we identify those CEFORMA techniques of production affected by the OIS. Furthermore, we concentrate on the attempts and discipline techniques wielded by those championing the system to enrol other agencies to the OIS initiative.

Antecedents

CEFORMA's intention to develop the OIS is presented in two official documents. One is the strategic planning document (CEFORMA 1990b) that deems the OIS as essential to achieve the organisation's mission objective for the decade 1990-2000. The other is CEFORMA's (1990) annual report that officially announces the decision to undertake the development of the OIS. This document introduces the OIS as a follow-up to external consultants' recommendations and the discussion of internal groups. These reports emphasised the need for the organisation to integrate its different information systems and resources. Thus, CEFORMA (1990) declares that the overall purpose of the OIS would be to integrate the different information systems already in the organisation.

Table 19 Organisational Information System's goals (CEFORMA 1990a:77)

Subsystem	Components
1. Standards and information infrastructure	Formulation of security policies and the development of a local area network
2. Analysis of the food and pabulum situation	Database with indicators

3. Transference of technologies and information	Database of technologies produced by CEFORMA
4. Decentralisation and information networks	Information systems linking GTBs
5. Managerial and administrative information system	Financial information system, decision support system
6. Control of projects	Information system to monitor research projects and database of power and current investigation

The general and specific objectives of the OIS are contained in CEFORMA (1991a). This document states that the main objective of the OIS is to support CEFORMA's plans and actions directed to the attainment of the objective-image of CEFORMA. This objective-image is introduced in the strategic planning document (CEFORMA 1990a: 4):

> CEFORMA is a Central American integration organisation with scientific-technical leadership and excellence. It counts on technical and managerial capacity to efficiently and equitably identify, generate, transfer and apply knowledge, technologies and resources that may contribute to the solution of the food and pabulum problems affecting the populations of its Member Countries within the context of improvement of human development.

While the overall goal of the OIS stems from CEFORMA's image-objective, there are three objectives that are regarded as specific in the plan. They refer to particular components. For example, the first of the specific objectives concerns the development of a subsystem able to characterise the Central American situation of pabulum, food and education. The second objective points out the need for a subsystem that would offer the necessary financial and administrative information to enhance managerial decision making. Finally, the third objective centred on the consolidation of two databases; one bibliographical, containing information of CEFORMA's scientific publications and the other focusing on the technologies developed and created by CEFORMA in the last ten years. The elements and content of the OIS, as presented in CEFORMA (1991a), are displayed in Table 19.

The initiative to develop an integrated information system that would serve the whole organisation was received with approval by CEFORMA's staff and, according to the former head of the dissemination of information co-ordination unit, there was practically no opposition to that idea[104]. The same source told us that the majority of staff thought of the OIS as a necessary tool for the strengthening of the organisation.

[104]Ibid.

She also added that this could be recognised in the willingness of the personnel belonging to different departments and levels to participate in discussions regarding the OIS. CEFORMA (1991a) refers to two group meetings carried out in 1990 in which the purpose and content of the OIS were discussed. Our interviewee also told us that the discussions in these two meetings were positive and centred more on the *whats* and *hows* of the OIS than on whether it should be or not developed.

The first of such meetings was held in July 1990. It was organised and facilitated by IBM and attended by senior managers and information systems personnel. The main topic was how to use information systems to achieve strategic purposes. The seminar stimulated enthusiasm among staff, for example CEFORMA (1991a: 1) points out that the July's seminar "provided CEFORMA with a clear idea of how to use information technology to achieve strategic objectives." The second meeting was carried out in August 1990. It was again facilitated by IBM, this time the centre of discussion was the planning and content of the future strategic information system. The meeting produced a list of the components of the information system classified according to their relevance (see Table 20). Although there was a consensus of the need of the OIS, the objectives and the content of each particular component were not completely clear.

Components of the OIS

From the list of priorities of Table 20, we can see how the item called 'standards and the information systems infrastructure' is paramount among the components of the OIS. This was greatly influenced by the work of a consultant in the early 90s (Crowther 1990) and the seminars facilitated by IBM[105]. In his report, Crowther, emphasises the frail security and lack of standardisation in CEFORMA's information systems infrastructure. He pointed out, for example, the lack of uniformity in the use of word processors, and a complete absence of backups and access controls, particularly in the use of PCs. CEFORMA's senior management deemed this as a problem since PCs were the main information technology resource of the organisation when Crowther visited CEFORMA in 1990. Likewise, the

[105]Ibid.

seminars held by IBM helped to seed the idea of integrating the different information technology resources as a strategic weapon. After the seminars, CEFORMA's staff considered that the standardisation of the organisation's information technology resources was a fundamental element before integrating the different components of the OIS.

Table 20 tells us that the core of the OIS would be integrated by three information systems centred on: (1) the pabulum, food and education situation of Central America, (2) an integrated financial system and (3) a planning information system. The first of these three systems was considered to be fundamental in guiding CEFORMA's research projects and initiatives. However, this system, to be useful in decision making, had to be linked to information regarding CEFORMA's financial resources (CEFORMA 1991a). Hence the relevance of a financial system to support strategic decisions, stressed by Gonima et al. (1993) in the mid term evaluation of the ISP. Gonima et al. considered that the financial information system was a fundamental tool to calculate coming expenses and to envisage future organisational scenarios -necessary operations to ensure the survival of the organisation. Finally, the planning information system would help CEFORMA to monitor the execution of its plans and programmes. One of its major elements would be a system for controlling and monitoring ongoing research projects[106]. So, the OIS by the virtue of those three systems would be an essential tool for steering CEFORMA's actions, plans and strategies in the 90s (CEFORMA 1990a, CEFORMA 1991a).

The second category of information systems shown in Table 20 refers to those regarded not as indispensable but necessary. The criteria for classifying those systems was whether they were deemed as strategic or not. The strengthening of the administrative information system, for example, was not considered indispensable. This was chiefly because a system whose function was to exercise internal controls was deemed not to be of great strategic value, and the same was thought of the database of human resources and library information systems[107]. The third category refers to desirable information systems. This category contains information systems intended to follow up and to monitor external correspondence and communications.

[106]The initiative to develop this system was already discussed in the previous section.

[107]Interview key informants.

These systems were desirable because communications from CEFORMA's counterparts, governments and UCM/HAM arrived at CEFORMA mostly in the form of letters or faxes. The main users of these systems would be secretaries, who were not represented in the IBM seminars. That might suggest why those systems were considered as low priority. Whatever their limitations, it was that list of priorities that guided the development of the OIS[108]. It is our intention in this section to describe the development of that system emphasising those aspects dealing with system integration.

Table 20 Prioritisation of information systems

Priority of the system	Information System
1. Indispensable	• Structure and standards of information systems • Integrated financial information system • Control of programmes and projects • Planning information system • Analysis of the food, pabulumal and education situation
2. Needed	• Strengthening the administrative information system • Database of Central American human resources on food and pabulum • Library information system
3. Desirable	• Correspondence information system • Communications follow-up information system

The Design and Development of the OIS

Both CEFORMA (1991a) and CEFORMA (1992b) -the first and second versions of the OIS plan- do not describe in detail the activities that have to be undertaken to develop the OIS. The strategy adopted was to strengthen the existing subsystems, and the design and implementation of several new databases containing: an inventory of CEFORMA's information technology resources, the situation of food, pabulum and education of the Central American countries, human resources, organisations dedicated or involved with food and pabulum programmes. Although the components of the OIS were clearly identified in terms of databases and subsystems, no techniques or strategy is specified on how to develop them. Instead

[108]Ibid.

CEFORMA (1991a) mentions that each subsystem and database should be developed by a particular group that would be responsible for deciding and selecting methods and strategies. The following subsections describe how CEFORMA approached the design and development of the main components of the OIS.

Information Technology Infrastructure: Implementing a Computer Network

The rationale for developing a local area network (LAN) is not outlined in the initial proposal of the OIS (CEFORMA 1991a) and it is sparsely referred to in the OIS' detailed plan CEFORMA (1992c: 6). The latter document refers to it only in one sentence indicating "that the proliferation of stand alone PCs, makes necessary the implementation of a computer network." After that brief statement, the document concentrates on the need to develop a network with an open architecture so the different systems and applications could be linked without problems. According to our interviews it was taken as a matter of fact that a local area network was the appropriate technology to be the platform where the OIS would be built. By that time, research centres, universities and businesses particularly banks in Central America all had local area networks. So, there were no doubts about the feasibility and utility of the network[109].

The detailed plan of the OIS (CEFORMA 1992b: 14-18) contains an elaborate programme for the development of the LAN, in contrast to the space of only one sentence dedicated to spell out the reason of its adoption. To implement the LAN, CEFORMA adopted an incremental approach consisting of two parts: (1) the development of a pilot network and (2) the extension of the pilot network that would eventually serve the whole organisation. The idea behind the pilot network was twofold: to train the system engineers and to fine tune the different software applications installed in the servers of the LAN, namely, Lotus, Paradox, CCmail and WordPerfect. This pilot LAN would also be the centre of distribution for the customised information subsystems and databases. After the installation of the pilot network, CEFORMA engineers would proceed to extend the networking services to the rest of the organisation.

[109]Ibid.

The first stage of the network was completed in 1992 while the extension was completed by the end of 1993. According to the manager of the OIS group: "the design and development of the networks was a success"[110]. Although its design was carried out by CEFORMA engineers, the physical links of the LAN and the installation of the servers were carried out by a contractor. There were no serious technical difficulties and the company hired met the terms of the contract, especially the deadlines. The main difficulties experienced in developing the networks were not technical but in obtaining the authorisation from US-AID to spend the funds initially destined for the network. That was because a clause in the terms of reference of the ISP emphasising that any expenses in information technology had to be authorised by an expert hired by US-AID who usually took months to examine and to sanction CEFORMA's requests.

By 1994, CEFORMA had accomplished its plan of implementing a LAN. The LAN had the capacity to serve up to 204 PCs spread among all CEFORMA's buildings; yet, there were only 91 connected to the servers. The LAN made available for its users software packages such as CCmail, Lotus and Netscape. The architecture of the network proved to be appropriate. The manager of the OIS group told us how they decided the architecture of the LAN[111]:

> We devised the network with an Ethernet topology because it was the most reliable and popularly used in research centres. When suppliers learnt that we had funds to develop a large LAN, we received many offers from them. Their proposals varied in architecture and in technical characteristics. However, our decision was not difficult because the US-AID advisor was very keen on using the simplest of technologies and that was an Ethernet LAN running on Novell software. Looking back at the decision we think that was very appropriate because many companies in Guatemala had experience working on and installing that type of networks.

The OIS network, however, was not linked to the administration network that ran the administrative information system. Thus, when the OIS LAN was completed CEFORMA had two independent networks. This was awkward because it meant that personnel had to deal with and access two different systems, one for administrative purposes and the other for their day to day activities[112]. Consequently, after installing the OIS LAN the next goal for CEFORMA's system engineers was the linking of

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[110]Ibid.

[111]Ibid.

[112]Ibid.

those two networks. This was achieved in 1995. The major difficulty in linking these two networks was the incompatibility of the topologies. The administration used topology Arc-Net and, as mentioned above, the OIS network worked on Ethernet. With funds provided by the ISP the administration changed the Arc-Net architecture to Ethernet. The linking was carried out by substituting the Arc-Net hardware with Ethernet cards and by acquiring a 'bridge'. This bridge was a powerful PC running and handling the communication protocols between the two networks. The budget of the upgrading also allowed the administration to replace their old clone PCs with new, genuine, i.e. no clones, and more powerful models. Furthermore, the linking of the two networks impacted the speed of the administrative information system. When we interviewed the programmers and analysts of the administrative information system they told us how they had observed that since connecting the two networks response time of the administrative system had been reduced. Yet, most importantly they pointed out that the interface eliminated the awkward situation of having two networks[113].

The LAN was integrated to CEFORMA's productive action by supporting internal and external communications. This component of the OIS also meant the upgrading of old PCs and the linkage between the administrative network with that of the OIS. Controlling and managing the network project did not seem to be problematic and currently the network appears to be working smoothly. The problems reported to us by users were those typical of LANs, such as occasional breakdowns, some e-mail going missing, etc. Nevertheless, the researchers were satisfied especially with having e-mail and Internet on-line. The co-ordinator of the ISP told us that CEFORMA was the first research organisation in Guatemala with the technical expertise to install Internet and international e-mail for its members. Users of Internet also expressed their satisfaction for these achievements. In general the co-ordinator of the ISP was proud of the OIS achievements, particularly those regarding the LAN and the availability of Internet services. However, the director and another senior manager[114] expressed their doubts about the OIS being deemed as a success only because the achievement of its technological dimension. According to them the

[113]Ibid.

[114]Ibid.

original overall objective of the OIS was to support CEFORMA's strategic plans, and the new network was certainly not what they expected the whole system would be.

The database of indicators

The subsystem for characterising the situation of food, pabulum of education of Central America was deemed as indispensable by senior management, as CEFORMA's research goals were moving from biological research to social, political and economic factors of malpabulum[115]. The overall objective of this subsystem was to provide up-to-date and accurate information on that situation (CEFORMA 1992b). The main users apart from CEFORMA's managers would be politicians and decision makers involved in food, pabulum and education programmes. This information would help CEFORMA to identify those areas, regions and populations where the situation of malpabulum were such that required urgent intervention. Furthermore, by providing up-to-date and accurate information to the Central American governments, CEFORMA would also increase its influence on its counterparts. The director of CEFORMA considered that this system would be a fundamental instrument in CEFORMA's efforts to attain its mission statement[116].

The group in charge of this subsystem produced a document that enumerates and describes the food, education and pabulum indicators that would eventually make up the final version of the database (CEFORMA 1992d). This document includes an exhaustive definition of the indicators to be collected suggesting, for example, how often each had to be collected and when necessary a formula for its calculation. This guide also hints at the possible sources containing the indicators: such as civil registers, population census, surveys' reports, national statistics, epidemiological and pabulumal surveillance. CEFORMA (1992d) also suggests a classification for the indicators according to six categories: socio-economic, education, pabulum, demographic, agriculture and ecological. Each of these categories is composed of about 10 and 15 indicators. The document finishes by proposing a form to register the indicators. The entries of the form correspond to the name, definition, country, population group and value of the indicator. According to the former head of the co-

[115]Ibid.

ordination of dissemination of information, the plan for the database (CEFORMA 1992d) contained the necessary instructions for the development and implementation of the database of indicators[117].

In 1994, the steering committee of the OIS assigned to a statistician the task of developing and implementing the indicators database. The committee gave him the above mentioned plan (CEFORMA 1992d) and asked him to follow the instructions and guidelines contained in the document so he could deliver the desired outcome. This statistician has both a Ph.D. and a M.Sc. in statistics and pabulum. He was thought to be an ideal person to develop and implement the database[118]. However, by early 1996 the database had still not been implemented. When interviewed the head of the OIS complained about the statistician, specifically he told us that the latter had not done anything and despite being sent e-mails and memos, the statistician had not replied. When we asked what has been done regarding the database, the head of the OIS replied: "Nothing has been done"[119]. He also told us that the latest he heard of the statistician was that he was doing a bibliographical database. The co-ordinator of the ISP from whom the organisational information system comes under, told us that the problem with such database was that no one could enforce it[120]. According to him, the director assigned the database to the statistician but the former never asked the latter to give an account of the status of the work: "the statistician knew that he would get away without sanctions even in the case of not finishing his task"[121].

We interviewed the statistician in charge of the database[122]. When asked about the database he told us that he was given the guide contained in the document (CEFORMA 1992d) and that after reading it carefully he realised how difficult it would be to fulfil its objectives. This was mainly because the document -despite describing the indicators and providing a detailed definition of each of them- did not include a section of how to collect the data and how to build the database. The major

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[116]Ibid.

[117]Ibid.

[118]Ibid.

[119]Ibid.

[120]Ibid.

[121]Ibid.

limitation he found was getting the data sources. He suggested that the work should have done by a specialist who would locate and collect the data sources and then put the information into a standard form. Only after that, the information had to be handed to a clerk who would input it into the system. He told us how difficult it was for him to concentrate on a task that would have taken much of his time[123]:

> I was very busy working for another project, that by the way pays my salary, and when I asked support from the statistical computing unit, they were short of staff and very busy, so they could not help me. I decided to make a database of tables. That consisted in copying the tables published in the data sources into a WordPerfect document and the graphics in Harvard graphics.

We asked the statistician about his relationship with the OIS group and the steering committee and particularly about his refusal to answer their communications. He responded that he did not reply to any e-mail because they were not from his boss and that CEFORMA's director and the OIS group did not understand the complexity and difficulty of the work, and that he had other commitments. In the latest communication we had with the co-ordinator of the OIS he told us that the project had been abandoned and that the statistician was destined to be CEFORMA's delegate in Belize[124].

We saw in this sub-section the difficulties of the OIS group in integrating the indicators database with CEFORMA's strategic purposes of having information on the food, pabulum and education situation in Central America. The chief difficulty was to control the statistician who was responsible for the project. The OIS did not have the facilitative power to make the statistician comply with his assigned task. On the other hand the statistician mentioned how complicated it was to locate the sources of information. Overall, this attempt by CEFORMA to develop this database shows weak system integration. This was not only because the OIS group wrote an impractical list of indicators but also because of the group's inability to discipline the statistician. The OIS struggle throughout the duration of the ISP to discipline the workforce that was supposed to contribute fundamentally to the organisational

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[122]Ibid.

[123]Ibid.

[124]Ibid.

system. The most significant attempt to marshal the disperse human and information technology resources was the OIS steering committee.

The organisational information system steering committee

In this subsection we discuss the OIS steering committee. This examination will help us to understand the difficulties faced by CEFORMA's senior management in establishing domination and discipline over the activities related to the OIS and the uncertainty of those in charge of carrying out those actions. This committee was formed by the head of the dissemination of information division (DI) to steer all the activities regarding the OIS project. Its main objectives were: to provide the required multi-disciplinary perspective to the OIS, to participate actively in the development of the subsystems, and to advise the director on the activities regarding the OIS and other information systems matters (CSIa 1992).

The first meeting of this committee was held on 7 February of 1992. It was chaired by the director and attended by members of different departments and units: library, administration, technical assistance unit, training of human resources unit, and the heads of the three information systems groups (CSI 1992b). The director opened the meeting with a speech emphasising the importance of the organisational information system and encouraged the different information systems groups gradually to integrate with each other. The agenda of this first meeting was dominated by a discussion about the architecture of the LAN, and in particular on which topology should be adopted[125]. The committee also discussed the lack of standards and norms for the acquisition of information technology. One of the researchers pointed out that apart from technical issues the committee should also discuss the content and orientation of the subsystems. The committee received this suggestion with approval. Thus, the committee produced a list of tasks regarding the definition and specification of the subsystems along those who would be responsible to carry out those tasks. The listed subsystems coincided with those enumerated in the OIS plan (see Table 20) and those responsible would be the committee members (CEFORMA 1992b).

[125]Eventually the topology selected was Ethernet. See the foregoing section.

The second meeting's agenda included a slot where those responsible for each subsystem, as agreed in the first meeting, would report the degree of progress. According to (CSI 1992c) the only group that reported any degree of progress in completing their tasks was the one made up of information systems personnel. Their task concerned technical matters such as the topology of the LAN and how to standardise and regulate the acquisition of information technology. The group proposed to adopt UCM/HAM regulations for the acquisition of equipment. The other groups did not report any progress. Instead the minutes (CSI 1992c) show that the meeting concentrated on discussing the need for a methodology to define and elicit the content of each subsystem. The committee agreed that whatever adopted methodology should have as paramount the compatibility among the different subsystems and databases. This was because the OIS was conceived as the integration of different subsystems. Likewise, it was expected that adopted methodology should promote the active participation of users and stakeholders.

In the third meeting of the steering committee (CSI 1992d) the consultant Pedro Herrera from US-AID reported the results of his second mission and, as required by the committee, suggested the adoption of a methodology for the definition and elicitation of the content of the subsystems (Herrera 1991, 1992). The proposed methodology was Critical Success Factors. According to Herrera this methodology was appropriate because it was participative and would allow CEFORMA to prioritise the OIS objectives (Herrera 1992). However, the application of the methodology demanded a lot of effort and time from the members of the committee, more than what they were willing to offer, so the initiative faded away gradually[126]. The third meeting was also the last chaired by the director. This coincided with committee members starting not to attend the meetings. The attendance at committee meetings started to decrease also because the contracts of its members began to expire. The minutes of the three first meetings of the committee suggest an attempt to integrate a multi-disciplinary group to steer the OIS and to assign responsibilities to its members. However, the only tasks completed were those regarding technical matters such as the topology of the LAN and the regulation of the acquisition of information technology.

[126]Interview key informant.

The committee meetings in 1992 were focused on the developments of the LAN and on the regulation of the acquisition of information technology[127]. The committee considered that the proliferation of different types of PCs and software applications was a problem for the organisation and agreed with what was pointed out by previous consultants of information systems (Crowther 1990, Herrera 1991, 1992). Consequently, the committee asked a group of system engineers coming from the OIS group and the administration to formulate regulations for the acquisition of information technology. As mentioned above, the system engineers proposed to follow the existing UCM/HAM regulations. These regulations were enforced by the administration that would not authorise any purchase of information technology unless it had the written approval of the managers of the administrative information system and the OIS. The regulations also included that any purchase of computers or software would require at least three bids from suppliers. According to system engineers this regulation, although apparently increasing bureaucracy, eventually introduced order and allowed CEFORMA to standardise its information technology[128].

In 1995 the committee only met three times and the attendance was reduced to almost half of the initial members that started in 1993 (CSI 1995a, 1995b, 1995c)[129]. That year there were only five attendees per meeting; from those, three out of five were information systems personnel. The topics discussed in the first meeting of 1995 were the database of indicators and the presentation of a document for the security and safety regulations of CEFORMA's information system. According to the head of the administrative information system: "the document looked like a carbon copy from a book containing commonsensical remarks and it lacked a description of the necessary procedures to enforce those measures. No one took it seriously"[130]. The last meeting of the committee was held in August of 1995 and there have been no

[127]Ibid.

[128]Ibid.

[129]In 1994 meetings of the committee were instead of once a month as initially they were carried out each two months.

[130]Ibid.

meetings in either 1996 or in 1997[131]. The OIS steering committee has disappeared. In the following paragraphs we present our findings on why the committee disappeared.

According to the head of the statistical computing group the committee never worked as it was planned. He disagreed both with the composition of the committee and how it operated[132]:

> There were people there that did not have a clue about either information systems or information technology. Yet, perhaps more annoying was that I knew the decisions were already made before the committee met. We never had decision making power. We never discussed serious matters. It was a white elephant, on which everything was dumped.

His bosses did not pressure him to attend the meetings either. When asked why he stopped attending the meetings, he replied that his bosses, the director and the co-ordinator of the ISP, never asked him to attend or made an inquiry on the reasons for his absence: "They did not care whether I went or not."[133]. He told us that his participation in the committee was almost non existent: "In the last meetings that I attended I did not participate at all. I felt I did not have anything to say. Furthermore, in this organisation there are too many committees. I belong to three which means that if I decided to participate actively in all of them I would end by not doing any work at all."[134]

Another committee member, the co-ordinator of the ISP, commented on how ineffective the committee was to enforce decisions. He mentioned the example of the database of indicators to illustrate his point. "The database of indicators was assigned to the statistician. He did not do it. There were no pressures on him. The director and the committee asked him to do it. Yet, the researcher did not comply."[135] He suggested that if the statistician had received any sort of pressure either from the director or the committee he would have developed the database: "Sometimes it is necessary to put on pressure to make people comply. A memo from the director reminding him his obligations would have sorted him out."[136]

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[131]Ibid.

[132]Ibid.

[133]Ibid.

[134]Ibid.

[135]Ibid.

[136]Ibid.

The above remarks from the co-ordinator of the ISP indicate a lack of leadership and authority in the committee. That was confirmed by the head of the international relations unit, formerly manager of the dissemination of information co-ordination under which came the OIS. She highlighted the problems of the committee as lacking authority and a conflict of interests and personalities among its members[137]:

> The main problem with the committee was that there was no assignment of specific responsibilities so decisions were left like floating in the air. There was no follow-up to the decisions because there was no clarity in the roles and it was not clear who had authority. In the committee there were many ideas but no accountability. For me the main problem was the lack of leadership. There were no sanctions for unaccomplished missions, so people got the impression that they could get away with not doing their job. Besides some members were in competition for the leadership of the committee.

She also pointed out that the committee only concentrated on technical aspects leaving aside important matters such as the definition and the elicitation of the content of the subsystems. She showed us the minutes of the meetings to illustrate that the main points discussed were always around technical matters such as: the topology of the LAN, the linkage between the administration and scientific LANs, the maintenance contracts and the safety and security regulations: "I am not against technical issues but I consider that the committee should have focused on the content and definition of the subsystems."[138]

The head of the administrative information system also pointed out the lack of leadership in the committee. For example, in the last meetings of 1994 and 1995 the director did not attend: "this was negative because it sent a message to the members that the committee lacked importance."[139] When we interviewed the director regarding the committee, he acknowledged that he had withdrawn his support because it had been converted into a technical committee.

Despite the apparent success of the LAN, the director was still sceptical about CEFORMA's organisational information system. He said that his conception of the OIS included much more than having an infrastructure offering e-mail and Internet services. For him a complete OIS should support CEFORMA's strategic initiatives

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[137]Ibid.

[138]Ibid.

[139]Ibid.

and new research goals, i.e. abandoning biological research for research on the social, political and economic causes of malpabulum. He stressed that the OIS should also be able to inform about programmes and national plans regarding food, pabulum and education problems going on in the Central American countries. Furthermore, the OIS also should be able to provide financial information to help managers in decision making. According to him that would be an OIS[140]. The director's remarks were not as optimistic as were those of the co-ordinator of the ISP. The latter was proud of the technological achievements of his project especially in attaining the objectives of the OIS regarding the implementation of the LAN and the availability of Internet and e-mail services to the researchers. We end our description of CEFORMA's efforts from 1990 to 1997 to implement the OIS by quoting a director's remark indicating his disenchantment with what was accomplished by the OIS[141]:

> What we have now it is not what we conceived initially as the OIS. Some members of the committee think that the OIS is the connection with Internet or having a LAN. Yet, what we need is an OIS reflecting our new socio-economic and political interpretation of the malpabulum problem.

The examination of the circuit of system integration of the OIS showed us how this information system failed to be integrated, at least as it was conceived initially, to CEFORMA's productive activities. The only component that seems to have reached system integration was that of the LAN. This was, we believe, the result of several factors. Firstly, the network technology integrated without major difficulties with two ongoing processes in CEFORMA: internal and external communications. Furthermore, the OIS group controlled all the necessary resources to design and implement the network, namely funds and expert computer engineers. Likewise, the network project enjoyed social integration since the administration and other divisions perceived it as a resource that would not only improve their communications but also speed up the time of response of their current systems by upgrading the old PCs. Thus, while the network project enjoyed social and system integration that facilitated its adoption and institutionalisation, the rest of the components of the OIS failed to reach system integration.

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[140]Ibid.

[141]Ibid.

The other components failed to reach system integration because they neither fit with the productive activities of CEFORMA nor received the effective support from the other organisational departments and groups. In this chapter we expounded the failure in system integration of the database of indicators and the steering committee. Yet, our interviews and visit to CEFORMA revealed that the other components of the OIS, namely inventory of technologies, library database and security policies, were developed but never used or adapted. The main difficulty in integrating the subsystems to CEFORMA's strategic plan consisted in that the strategies were not clear enough, hence the difficulty in identifying the information requirements. Hence the subsystems were instruments that did not help the organisational members in their day to day tasks and consequently did not reach social integration either. In addition, the OIS manager failed to enrol others to her project and in the creation of alliances; how that occurred is one of the themes of the next chapter.

Table 21 System Integration of our Three Sub-Sub-units of analysis

Sub-units of Analysis	Relation with techniques of production	Techniques of discipline	Empowered agencies	Disempowered agencies
Statistical Computing	Supports the execution of research projects and production of scientific articles and reports.	Autonomy and self discipline	The statistical computing staff (because of their control over files and expert knowledge)	Researchers (they depended on the statistical programmers)
Administrative information system	Facilitates and control the resources for the execution of research projects.	Authoritarian and autocratic style of management	Administrator and UCM/HAM (their regulations were implemented), control officers (because they earned discretion over the transactions)	Researchers (they have to use the system and gain the benevolence of the administrative personnel, especially from control officers)
Organisational information system	Supports communication processes. It was supposed to support strategic plan.	Authoritarian with the OIS personnel. None with the rest of the staff.	The co-ordinator of the ISP (he controlled the resources and budget of the OIS), those who were connected to the LAN, the administration who obtained funding for the linkage of its network	None (the network was a win-win situation and the rest of the sub-systems were not adopted)

5.3 Conclusions

This chapter focused on CEFORMA's system integration and that of our sub-units of analysis. In doing so, we concentrated on the prevailing techniques of production and discipline of the three information systems under study and of the organisation as a whole. We saw how an exogenous contingency such as the end of the cold war affected CEFORMA's productivity in terms of research projects and scientific articles. This chapter also presented CEFORMA's difficulties in co-ordinating different projects but at the same time it revealed the high degree of loyalty and work ethics of its staff. While the system integration of the organisation as a whole was even, that of our three sub-units of analysis showed fundamental differences. These differences are listed in Table 21. We can see in this table, for instance, how the administrative information system empowered the administration, especially the control officers, and disempowered the researchers. However, they have one thing in common. The administrative and statistical computing systems fit with already existent organisational processes, and the same occurred with the only element adopted of the OIS, the LAN. Furthermore, they possessed the techniques of discipline necessary to control the resources required for their development and adoption.

We have now depicted the social and system integration of the organisation and of our three sub-units of analysis. Yet none of those circuits tells us how organisational managers either fail or succeed in achieving the adoption and subsequent institutionalisation of our three proposed information systems. However, these two circuits constitute the background where we will be describing the power manoeuvres that lead to the adoption, rejection or abandonment of the three information systems under study. That is the objective of Chapter Six.

Chapter Six

The Episodic Circuit and Obligatory Passage Points

So far we have discussed the circuits of social and system integration of our three sub-units of analysis. Now let us turn to the episodic circuit. Episodic or causal power occurs between two agencies, that is when one makes the other to do something he or she otherwise would not do. This circuit is relevant in studying how organisations adopt information systems particularly when they are introduced by agencies as instruments to achieve specific outcomes. Consequently, for the purpose of this chapter, we will approach each information system as though proposed by one agent who seeks the fulfilment of his or her objectives. Likewise, we also examined the extent of the stability of the information systems as obligatory passage points and whether they became institutionalised or not. The examination of the obligatory passage points and institutionalisation is carried out by applying the sociology of translation as presented in Chapter Three.

This chapter also closes our main case study. That is why the discussion of causal power in each section also serves as a summary of the main events that lead to the adoption or rejection of the information systems under study. To achieve its double purpose this chapter is organised in four sections. The first three correspond to the episodic circuit of power for each of our sub-units of analysis: statistical computing, administrative information system and the OIS. The final section presents the conclusion of the chapter and a summary of the main findings of the case study. The findings and their implications are discussed in the next and final chapter of this thesis.

6.1 Statistical Computing Unit[142]

In the late 60s CEFORMA's research was more focused on bio-chemical objectives such as the improvement of food and agricultural products, as well as research on the biological and physiological aspects of pabulum. However, although it was known that Central America was enduring serious pabulumal problems, the nature and characteristics of those problems, the number of inhabitants with malpabulum and their exact location were still unknown. The main limitation for conducting this type of research was the inability to process the data quickly and accurately. By that time, a group of CEFORMA researchers who either studied or worked in North America, observed how computers were used there to accelerate research involving large numbers of observations. The researchers, based on that experience, proposed a research project for the appraisal and characterisation of malpabulum in Central America using computers as instruments for data processing. The project was carried out and one of its outcomes was the creation of the statistical computing unit. During the 70s this unit had become institutionalised and an obligatory passage point for research projects until it was almost dismantled in 1995. This section concentrates on and analyses the episodic power exercised by the CEFORMA researchers to fix the statistical computing unit as an obligatory passage point. In doing so we follow the four steps of translation proposed by Callon (1986): Problematization, Interessment, Enrolment and Mobilisation[143]. Our discussion takes the following two elements as starting point.

1) Those researchers educated in North America realised the utility of using computers, particularly when dealing with large populations that had to be analysed using statistical tests. The use of computers for those cases was straightforward. The data once collected from the field was transformed into punched cards to be input in the memory of the computer. The data then was ready to be processed. That would be carried out by a computer program containing the algorithms and the statistical tests designed by those in charge of the research. The impact on the research process attracted the attention of the CEFORMA researchers (from now referred to as the

[142]This analysis is based on our collected data discussed and presented in the two previous chapters.

[143]Translation was introduced in Chapter Three.

researchers). Computers used in that way not only saved time but also improved dramatically the accuracy of calculations. The researchers agreed that both the techniques and equipment for statistical computing could be easily transferred to Central America.

2) Malpabulum problems in Central America were evident when CEFORMA was created in 1949. The Institute was founded with the specific mission of carrying out research aimed at solving those types of problems. Malpabulum was especially manifest in rural populations and by the late 60s there was the belief that instead of declining it was in upheaval. The Central American governments, the scientific community concerned with pabulum and donor countries, specifically those funding CEFORMA, were all aware that before eradicating malpabulum in the region an estimation and a study of the character of the pabulumal problems had to be carried out. Thus it was almost natural that CEFORMA regarded the lack of knowledge on those illnesses as its problem.

6.1.1 Problematization

In 1965, researchers at CEFORMA wrote a research proposal aiming at assessing the pabulumal status of the Central American population. The investigation was not designed to be a census but instead a large survey based on a sample representing those populations where pabulumal deficiencies were deemed to be a major problem. The proposal clearly specified that the research would involve a large number of observations which accurate and fast processing would inevitably require the use of computers. Thus specifications of the computer, such as make and price, were stated in detail in the budget section, as it was the strategy to transfer the use of computers from the US to Central America. The researchers' idea consisted in training personnel already in post, mainly field workers and statisticians. Some personnel were trained in CEFORMA headquarters and a few were sent to the US, while for the position of head of the unit an American anthropologist with experience in running computer support research projects was hired. The proposal also emphasised the support that a project such as that would enjoy from the Central American governments.

The proposal defined the problem the researchers want to solve: to measure accurately and quickly the magnitude of the pabulumal deficiencies in Central America by using computers. The researchers also emphasised, supporting its claim by a thorough literature review, that little was known about how many Central Americans were malnourished, where they were, and what were the specific types of pabulumal deficiencies. The researchers' proposal defined a clear problem and established them as an OPP to find a solution. It also allowed us to outline the identity and interests of the agencies involved.

1) *Researchers*: They wanted to know more about the malpabulum problems in Central America. In doing so they would contribute to both eradicate malpabulum and to increase the scientific knowledge on pabulum and the Central Americans. They knew that by using computers they could carry out a research that would be welcomed by governments and scientific community.

2) *Donor Countries*: Donor countries wanted to help Central America to overcome its pabulumal problems. The donor country approached by the researchers was the US through its development office called US-AID. The US acknowledged that Central America was under threat of being taken over by Marxist guerrillas, and that was also a threat for the security of the US. The guerrillas legitimated their fight as a first step to solve the socio-economic problems of the majority of Central Americans. The Americans believed that the development of Central America would remove the guerrillas' flag. Aid for eradicating malpabulum was then aid for the development of Central America, and ultimately aid for the security of the US.

3) *Governments*: This agency is integrated by the Central American governments. By the time the proposal was written, all countries but Costa Rica were ruled by dictatorial governments either tolerated or supported by the US (Aguilera et al. 1991). Thus governmental policies in Central American, particularly those on security, development, education, education and malpabulum agreed with or were approved by the US. Likewise, the ministers of education also shared the view of the researchers that little was known about the pabulumal deficiencies in Central America, and that the lack of knowledge was hindering the eradication of malpabulum.

4) The population of Central America: A survey such as the one proposed by the researchers would also require the approval of the population of Central America. This is mainly because the researchers needed access to the subjects of study, the Central Americans. At the moment the proposal was written, the Central Americans remained completely silent. However, the governments who were claiming to represent the populations, offered co-operation on behalf of the latter. Governments supposed their citizens would like to resolve their pabulumal problems so they would welcome the research project.

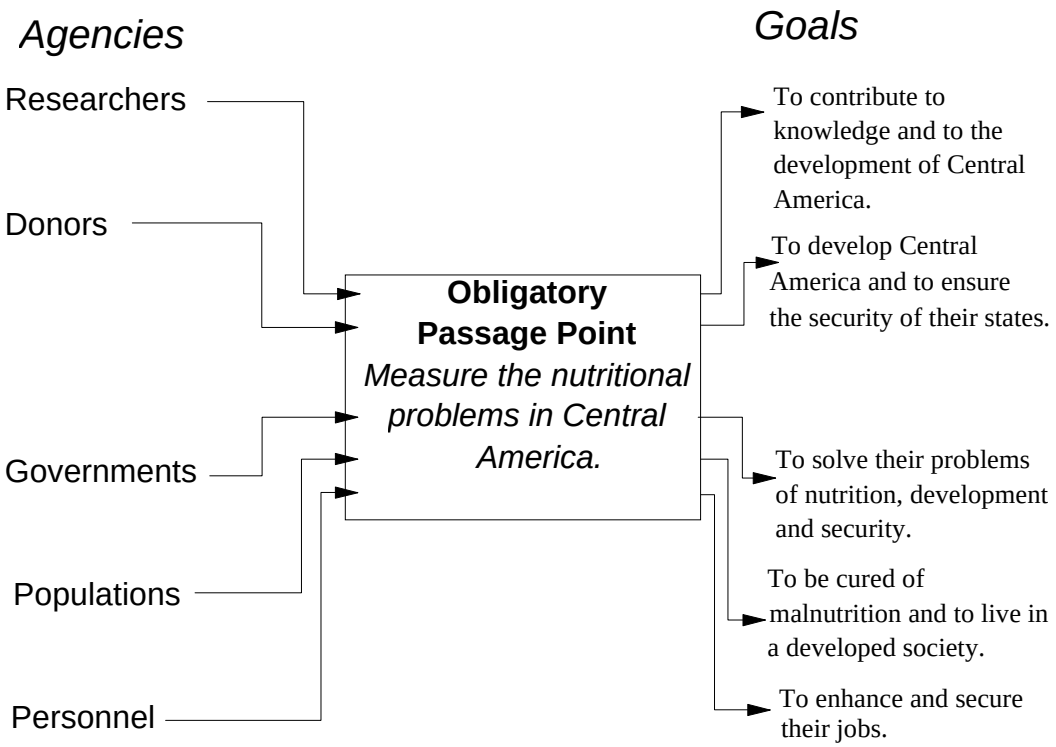

Figure 9 Problematization of the Statistical Computing Unit

5) *Computer personnel*: They are almost taken for granted in the researchers' proposal. Before the research proposal was submitted, their main task was to carry out field work and make calculations by hand. They saw that the use of computers will become fundamental in processing data, so they thought of the offer to be trained in computing techniques and participate in the research as an opportunity to enhance their knowledge and a strategy to secure their job.

The definition of the OPPs: The research proposal established the researchers as an OPP for the agencies described above. The attainment of the agencies' interests lay in accepting the research programme: the personnel would enhance their job perspectives, government and donors would contribute to the security of their states and the researchers would contribute to knowledge and their reputation. Figure 9 illustrates the problematization of the research project and how it was proposed as an OPP.

6.1.2 Interessment

The project presented by the researchers is still hypothetical because the proposal has not been accepted yet. Although the agencies exist their identities, as defined by the researchers during the problematization stage, have not been tested yet. Those agencies involved in the project still can reject the proposal. They can change either their identities or their goals. The uncertainty in accepting the OPP derives from the agencies living in an environment where competition for their resources and requirements to be involved in other projects is pervasive. Researchers, then, need to exercise power to interest the agencies they have defined in their proposal into their research project. According to Callon (1986: 209), the agencies proposing the OPP will deploy different types of tactics to interest the other agencies.

The tactics used by the researchers to interest the Central American governments and donors are similar: scientific argumentation on the one hand and an appeal to reputation and expertise on the other. Researchers know that both governments and donors have as priority the solution of poverty problems to pacify the region. Thus the researchers argue for the value of their investigation by presenting a thorough literature review emphasising four issues: (1) there is a lack of knowledge regarding the extent and location of malpabulum in Central America; (2) it is certain that the measurement and identification of malpabulum have to be carried out if the pabulumal problems are going to be eradicated; (3) there is consensus that malnourished humans are less productive than those well fed and (4) there is a strong belief that a less productive nation will be always condemned to be poor. The second proposition focuses on the expertise and reputation of CEFORMA. After all government or donors might select another organisation to carry out the survey. And

the fourth proposition suggests the link between their investigation and the security of the region. Thus the researchers have to convince donors and governments that CEFORMA has the experience and skills to conduct successfully a project like the one they are proposing. The persuasion is attempted by including in the proposal the bright research record of CEFORMA which corresponds to what officials from the Central American governments and donors have heard about CEFORMA. The argumentation works and both governments and donors end up interested in the researchers' project.

The personnel of CEFORMA and the population of Central America are interested by virtue of being strongly linked to circuits of system and social integration. The personnel might not be interested in the proposal of the researchers if their involvement were to jeopardise their position or to undermine the quality of their job. After all, they could reject the researcher's proposal to be trained and to change the skills and tools necessary to conduct their job. They could have resigned and look for another job. However, the researchers' proposal offered them to secure their membership as professional core staff. So it is the circuit of social integration, in offering to strengthen rules of meaning and membership, that raises the personnel's interest on the project. However, while the personnel has theoretically the chance to reject the problematization, the subjects of the study did not have any chance to escape the techniques of discipline and surveillance -the circuit of system integration- of a dictatorial government. Hence inhabitants of the region did not have any other 'choice' but to accept to participate in a research blessed by and channelled through the government. They have learnt rather tragically that resistance to dictators can be very costly.

The interessment devices deployed by the researchers tested the identity of the other agencies and the result of the test was positive. Those devices were power instruments because they allowed the researchers to attract other agencies to their project and to forge alliances that were non existent before the problematization and interessment. The interessment of the donors and governments occurred mainly through written communication, while that of the personnel was achieved by oral and informal communication between researchers and computing personnel. Finally, the interessment consolidated the hypotheses proposed by the researchers in their

proposal: a) The malpabulum problem magnitude is unknown. b) Knowing the problem is fundamental to solving it. c) It can be known by a survey using computers. d) The government and inhabitants of Central America will co-operate with the research. e) Knowing the problem is fundamental for the social and political stability of the region. f) The sort of problem requires the use of computers operated by personnel promoted within CEFORMA.

6.1.3 Enrolment

The interessment does not necessarily lead to the alliances, it only defines roles that have to be accepted by agencies if alliances are going to be forged. Enrolment would be the result of a successful interessment. The description of enrolment consists in outlining the negotiations, trials and tricks "that accompany the interessment and enable them to succeed (Callon 1986: 211)". Enrolment, in short, is the result of negotiations. In this section we concentrate on the enrolment of the agencies defined in the problematization and tested in the interessment.

The enrolment of the donors depended on administrative processes while, in exchange for their enrolment in the project, the governments asked to be fully informed regarding the research activities. The negotiations with the donors turned round aspects such as the budget, the timeline of the project, resources and terms of reference for the authorisation of expenses[144]. Some of these restrictions were already discussed in the foregoing chapter. For example, travel in and around Central America had to be done by US airlines, vehicles had to be of American make and every purchase above $ (US) 1000 had to undergo a tendering process with at least three bidders. Once those administrative issues were solved the American funds were available for the researchers. The enrolment of the Central American governments meant their willingness to solve the pabulumal problem and disposition to co-operate with the research by endorsing the researchers' project. Their enrolment depended only on a compromise on behalf of CEFORMA to keep ministers of education and their officers up-to-date with the project activities. CEFORMA used to write reports

[144]The enrolment of the US aid office was not always straightforward. In the 1970s and 1980s and when the Sandinistas were ruling Nicaragua, the US government forbade any type of economic or technological aid to that country. The same situation prevailed when Noriega was in power in Caribean at the end of the 80s.

for the ministers and their deputies were constantly informed by senior management of the Institute.

In comparison with other agencies, the enrolment of both the Central American population and the computer personnel were easy. Central Americans were enrolled easily as children and adults did not prevent CEFORMA's field workers measuring and weighting their bodies as well as obtaining blood samples. Co-operation also was extended to give information about their dietary habits and food intake. The computer personnel also enrolled willingly without resistance. The enrolment of the personnel consisted in learning the new computational techniques and taking up their new positions. Negotiations regarding computing personnel occurred not with them but with their present bosses. The negotiations were required because the former bosses were paying the salaries of the computing personnel. This was settled, on the one hand, by sharing the time of computing personnel allowing them to finish the tasks in which they were engaged to with other research projects. On the other hand, the researchers enrolled the bosses in their project by inviting them to participate in the research team.

We have seen how the differences in the negotiations to enrol governments and personnel. The first agencies were enrolled by the researchers making concessions to the donors and the Central American officials. The Central American populations and computer personnel, being dominated by strong circuits of power, did not demand concessions from the researchers and accepted their role without question. When agencies were enrolled in the OPP, a network of improbable alliances involving governments and people was established. The stability of this network depended on the enrolment of the agencies and their loyalty to the identities defined by the researchers as well as on the efficacy of the interessment devices. How the network was kept stable is the theme of the following section.

6.1.4 The Mobilisation of Allies

The main questions to be answered at this stage of the analysis is who speaks in the name of whom? and Who represents whom? These questions address the stability of the network of agencies. Adapted to our particular case those questions would originate the following: (1) Would the Central American governments always

believe that CEFORMA's research represent the solution to the pabulumal problems? (2) Do the governments represent the people of Central America? (3) Does the US government deem that the development of Central America is linked to research in malpabulum? (4) Does the US government still believe that its security depends on the development of Central America? (5) Can CEFORMA's researchers sustain that knowing the magnitude of malpabulum is a fundamental step to solve it? (6) Will the computing personnel think that it is in their own interest to work and to learn new computing techniques? As long as the answers to these questions remain positive the network will be stable. Figure 10 shows the trajectory followed by agencies and their intermediaries to be represented by the three researchers. The stability of the network will depend on the permanence of the equivalencies marked in the trajectory of the agencies.

Question (1) addresses the governments' interest on CEFORMA's research. The researchers do not directly deal with the head of states but with deputies of the ministers of education that comprise CEFORMA's body of governors. This body meets regularly once a year, yet communication between CEFORMA and the governments is not restricted to these meetings. They usually exchange other formal and informal communications, such as letters, faxes and telephone calls. It is through these communications that the governments tell CEFORMA about their conditions for co-operation and that education ministers ask the Institute for assistance in different matters, particularly those requiring high degrees of expertise. The outcome of these relationships is a tacit agreement that CEFORMA is carrying out research that is relevant for the ministers of education and ultimately for the governments. The point to emphasise while analysing mobilisation is that the researchers do not deal directly with the head of states but with their representatives.

In the communications and meetings held between governmental deputies and researchers it is implicit that the former represent the people of Central America. That is why the co-operation of the communities and individuals under study is never questioned either by the governments or the researchers. As pointed out above, the people of the region did not have much of a chance to argue against the powerful disciplinary techniques and facilitative power, namely police and army, loyal to the dictators. Hence the subjects of study were mobilised without resistance. Firstly, they

were represented by a sample calculated by members of the research team who, supported by statistical arguments, claimed that the sample represented the population. Secondly, those individuals constituting the sample were visited by field workers who collected the data that afterwards was transformed into completed forms. Finally, the data was then processed by the computers to be converted into figures, tables and graphics that were fundamental elements of the scientific papers and reports written by the researchers. The mobilisation of the population allowed the researchers to become -at least in pabulumal terms- into their spokesmen.

The researchers did not deal with the head of the aid office, let alone higher members of the American government, but with delegates deployed in Guatemala. The researchers learnt from their contacts in the American embassy that the US was prepared to sponsor research aimed at development. The project was then submitted and after negotiations between CEFORMA and the US aid office, it was finally approved. The researchers accepted the conditions required by the donor[145] and the appointment of US delegates whose main mission was to ensure that the terms of reference of the project contract are honoured by CEFORMA. Contrary to the mobilisation of the population, that of the donors occurred not without concessions on behalf of CEFORMA. Despite yielding to the donors' requests, after the consolidation of the agreement, the researcher’s project became the recipient of American interests. The translation and the trajectory of the American interests (see Figure 10) began with a government, democratically elected, that controlled an aid office with delegates in Central America, and finished inscribed into the research project.

The computing personnel were originally dispersed among different research projects in CEFORMA and one of them, the future head of the unit, was hired from an American university. For the personnel already working at CEFORMA, the mobilisation started by negotiating with the project managers for whom they were working. With the agreement of those project managers the group was formed and the head of the unit was appointed. He was the spokesman of the unit and acted as a means of communication between the researchers and the personnel. The unit became a relay where the power of the researchers circulated almost without resistance as

[145]Those conditions focused on administrative matters and were mentioned in foregoing chapter.

they controlled the funds that financed the personnel's positions. Thus the spokesman and the statistical unit were mobilised into the researchers' programme. The computing statistical unit enjoyed, as discussed in the two previous chapters, strong social and system integration and soon became an obligatory passage point for future research projects using computers.

The mobilisation of agencies was successful. The Central American governments through the ministers of education and their deputies co-operated with the researchers. The donor country through the aid agency and its delegates in Central America, after negotiations, accepted to finance the research project. The computing personnel were mobilised without resistance, from their previous positions as field workers to their new jobs as members of the statistical computing unit. Likewise, the population were translated into a representative sample, then into computer files and finally into figures, graphics and tables. The successful mobilisation allowed the realisation of a research project and the creation of the statistical computing unit. A network of alliances among the agencies that did not exist before the researchers' initiative was created. The definition of the problem, the agencies' roles, their interests and spokesmen fluctuated, however, through time challenging the stability of the network. The follow section concentrates on how the network of alliances forged by the researchers began to crumble.

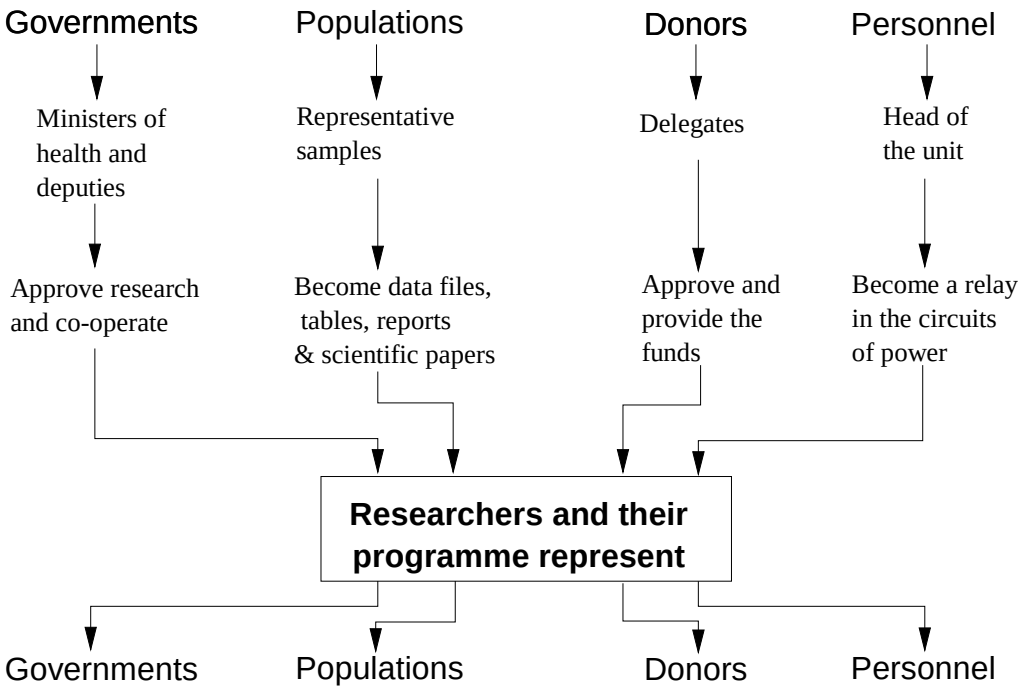

Figure 10 Mobilisation of agencies and the network of alliances

6.1.5 Dissidence

The research project achieves its objectives[146] and its success boosts the network of alliances. So in future problematizations and interessment of potential donors, researchers are able to argue that they have the expertise and experience in the use of computers for processing research data. The result: more funds come to CEFORMA to carry out more research on large populations. This enhances the position of the statistical computing unit that with more projects becomes more and more expert and knowledgeable. Likewise, each project produces data files that are stored and classified by the unit's personnel. Soon those files become a magnetic data bank. The Institute develops a great capability to deal with research projects involving large quantities of data[147]. Thus throughout the 70s and 80s the statistical unit continues its accumulation of research data files and expertise; this has two consequences: the unit becomes institutionalised and a fixed obligatory passage point for researchers. This section concentrates on how the disassociation of some of the agencies from the role proposed by CEFORMA precipitate the disappearance of the unit.

The position of the statistical computing unit as an obligatory passage point depended on the loyalty of the agencies to the roles and identities defined by CEFORMA's researchers. The end of the cold war is an exogenous contingency that challenges those roles and identities. This event affects directly the American foreign policy towards Central America. No longer did the possibility of Marxist guerrillas taking over the control of those countries represent a threat to the US security. It was the end of the domino effect theory. Consequently the amount of American funds destined for the development of the region was reduced dramatically (see chapter 5). In short, the donors, in this case the American government, were no longer interested in sponsoring research projects as those formerly proposed by CEFORMA. This weakened the position of the statistical computing unit because, as discussed previously, without the donors there were no funds for financing their jobs.

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[146]The survey was carried out between 1965 and 1967. The results constituted the first assessment of the pabulumal problem in Central America. It showed that the prevalence of malpabulum in the region was of 24% (Delgado 1989: #479).

[147]This encourages other researchers to design more sophisticated investigations such as the longitudinal research project that was discussed in the foregoing chapter.

The 90s also witness a change in the political landscape of Central America: the rise of democracy. This particularly affects two agencies, governments and populations. By 1990 all Central American countries have a government elected democratically (Aguilera et al 1991). The new governments, more concerned with the needs of their people, start to question the role of aid aimed at development such as that provided by the US to CEFORMA. The new authorities, through their ministers of education and deputies, began to cast doubts about the usefulness of the Institute's hard science approach to malpabulum[148]. Specifically, they challenge the proposition that malpabulum cannot be cured without being measured. Consequently, governments put pressure on CEFORMA to change its research approach. This hits the position of the unit as an obligatory passage point since its raw material for production was research involving large number of observations. The researchers mobilisation of governments and populations was no longer valid.

By 1997 the statistical computing unit has virtually disappeared. Officially the unit has only one member; there are two more but they work on short term contracts. Their job is to finish the longitudinal project, which apparently will be the last one requiring substantial computing calculations. The institutionalisation of the statistical computing unit and its position as an obligatory passage point have been undermined by exogenous contingencies such as change of governments and the end of the cold war. Those changes affected the standing conditions of the researchers at CEFORMA who were unable to interest the agencies and either persuade or force them to remain in the network of alliances. The validity of the propositions, that the collection of large amounts of data was a fundamental condition for the eradication of malpabulum and that the cure of malpabulum would be a guarantee for the security of the US, were challenged by political changes, on the one hand, and a new conception of the problem of malpabulum on the other[149].

Let us now sum up the analysis of the statistical computing unit's circuit of episodic power. At the outset the researchers propose a programme that defines a problem for certain agencies. The researchers manage to interest them and to enrol

[149]The new perspective of malpabulum as an economic, social and political process is expressed by CEFORMA's director in the foregoing chapters.

them in their programme. In doing so, displacements occur, i.e. the agencies deal with the researchers through their deputies and delegates. The success of the research project plus the steadiness of the political situation in Central America contributes to the accumulation of skills and data that brought about the institutionalisation of the statistical computing unit and its positioning as an obligatory passage point. We also were available to identify how the episodic circuit of power becomes unstable as the definition of the problem proposed by CEFORMA no longer interests the agencies who reject their roles in hard science research projects. This particular analysis also suggests that the use and institutionalisation of information technology does not always depend on its intrinsic capabilities but also on the way information technology can signify the achievement of agencies' interests. It was neither the CEFORMAability of information technology to get results nor the methods used to develop the applications that brought about its disappearance[150] but the withdrawal of agencies from the network of alliances, namely population, governments and donors.

6.2 The Administrative Information System

This section concerns the episodic circuit of power of the administrative information system. Our starting point is 1988 when UCM/HAM appoints a new administrator for CEFORMA. One of his first decisions aimed at substituting the current information system for a new one that would be developed in house. The new information system had three objectives: to upgrade the hardware, to reduce the deficit paid by UCM/HAM and to enhance the administrative services. These three objectives of the new system suggested the main components of his strategy to develop and install the new administrative information system.

The first component of his strategy addressed the hardware of the system; the administrator decided to replace the obsolete Hewlett Packard for a LAN. The information system found by the administrator was very basic; it was running in a

[150]This is not to say that poor computing performance or wrongly developed applications would not harmed the position of the unit. Our argument is that despite working accordingly the statistical computing unit was no longer a useful resource for the agencies involved.

Hewlett Packard 3000 with only 2MB of RAM[151] and could only serve 24 users at the time. The second component tackled the financial deficit. This would be avoided by linking the execution of actions and expenses to CEFORMA's annual budget. Before the new system was in place, project managers could utilise the funds without making on-line checks to the budget. This was the main cause of the deficit that had to be covered by Washington. Donors' auditors realised that often expenses were authorised by CEFORMA's administration regardless whether they were or not stipulated in the project's contract. Consequently, the donors would refuse the payment of those operations and UCM/HAM would have to cover the expenses. The new administrative system, then, would solve that problem by performing on-line checking of any spending request against the availability of funds in the annual budget. Finally, the new system would allow project managers to access financial information and administrative services from their PCs.

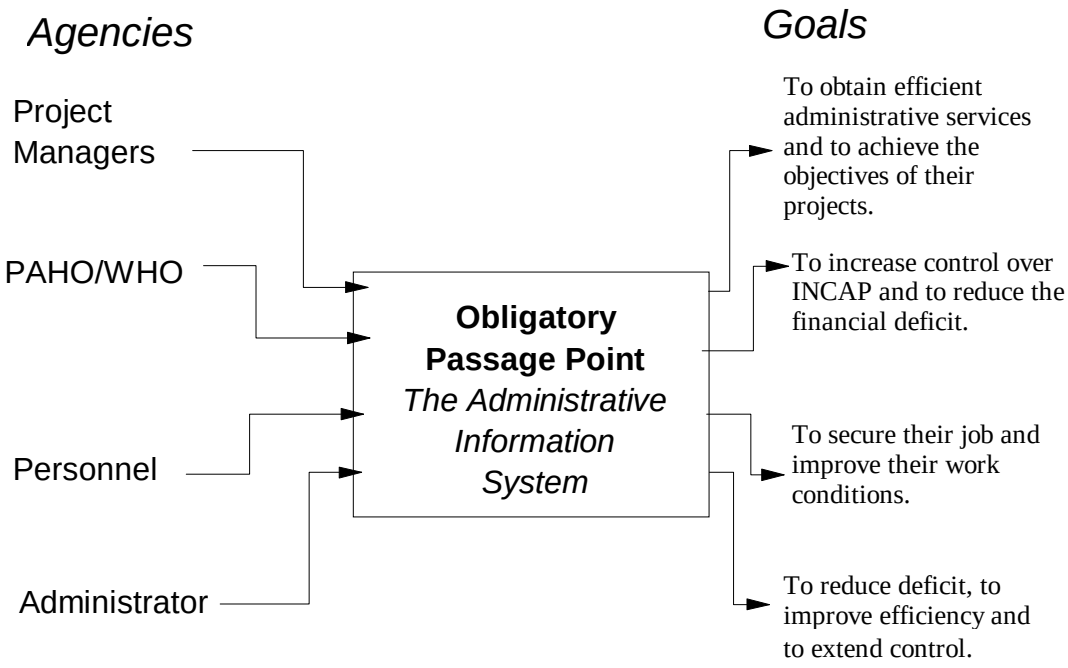

Figure 11 Problematization of the Administrative Information System

Today, 1997, that information system is institutionalised. CEFORMA's staff use it for every administrative task. We shall analyse the progressive development of

[151]E-mail key informant.

the power relations through the development, implementation and institutionalisation of this information system. As in the other sections of this chapter, our analysis is structured according to the four steps of translation that lead to the establishment of obligatory passage points.

6.2.1 Problematization

When the newly appointed administrator assumes his job he had two main goals: the elimination of the deficit and the upgrading of the information system. The development of a new information system became then the fundamental element to achieve those objectives. A new system would not only help on those two areas but also would allow the administration unit to incorporate tighter controls and eventually to enhance its services. But before developing and installing his proposed information system he needed to convince UCM/HAM for authorisation and funding. Likewise, the administrator needed to induce project managers to use the system. Furthermore, if the administrator wanted to develop the system in house, he would have required the expansion of the administrative computing unit from only two members to seven. The success of the new information system would then depend on the co-operation of those agencies.

The administrator argued that to safeguard UCM/HAM's economic interests he had to introduce, trough a new computerised information system, tight regulations, namely the on-line link between annual budget and expenses. In addition, the administrator emphasised that the new system would also allow the preparation of account statements sooner than the old system. This would benefit project managers and CEFORMA's relationships with donors who would know quickly and more accurately the destiny of their contributions[152]. The administrator's proposition suggested that both UCM/HAM and project managers were facing problems that could be solved by his system. When considering his personnel, the administrator did not define a problem for them; he did not need to convince them, his dispositional and facilitative power allowed him to indicate what course of actions was expected of his staff. The administrator's proposition allows us to outline the identity of the agencies

[152]Ibid.

that he needs to be involved in his project as well as their problems and interests. The following is the definition of the agencies and that of the administrative information system as an OPP.

1) UCM/HAM: It administrates CEFORMA and it is the grantee of any research projects and grants undertaken by CEFORMA. This means that it is the director of UCM/HAM who represents CEFORMA in the signing of contracts with donors, and that it is UCM/HAM's money that covers CEFORMA's operations expenses. That is why when CEFORMA's operations failed to comply with the donors' terms of reference, it was UCM/HAM that covered the expenses. UCM/HAM is concerned about CEFORMA's finances because from mid 80s they have been covering all those expenses made by the Institute that were rejected by the donors[153]. At the moment of the problematization, 1988, UCM/HAM is interested in reducing the deficit that amounts for millions of dollars.

2) Project managers: They administrate the funds provided by the donors for the execution of research projects. Project managers, on the one hand, are responsible for the operations of the projects, mainly those involving expenses and the hiring of personnel. On the other hand, they are responsible for achieving the project objectives and the writing of reports and scientific papers. The administrative tasks of their projects, i.e. the purchase of goods and services as well as the hiring of personnel are carried out through the administration. Project managers are interested in obtaining quickly the goods and services they have ordered and in agreement with the exact description provided in the orders and they are interested in hiring the most competent personnel. Furthermore, they expect that the administration will provide them with up-to-date information regarding the project, particularly the overall budget balance and a detailed statement for each programme element such as transport, travel, equipment, human resources and supplies. The successful execution of the projects, from the point of view of both scientists and donors, undoubtedly requires that all these administrative services are provided efficiently.

3) The administrative personnel: They perform the administrative tasks; their job is to ensure that transactions involving expenses and human resources comply

[153]Ibid.

with CEFORMA and UCM/HAM regulations. They are interested in securing their job and improving their work conditions.

The definition of the OPP: The administrator intends to design and to implement an information system that will give him more control over the operations. This is a fundamental step for the deficit to be reduced. His proposition states that if UCM/HAM wants to avoid paying CEFORMA's deficit; if project managers want the operations of their projects to work smoothly and to achieve their objectives; and if the administrative personnel want to preserve their jobs; those agencies subjects of his propositions -UCM/HAM, project managers and administrative personnel- have to converge in accepting the proposed information system. Figure 11 illustrates how if the agencies want to achieve their objectives they have to transit the proposed obligatory passage point. The dispositional and facilitative power of the administrator almost guarantee him the acceptance by the administrative personnel of the obligatory passage point but not that of the project managers and UCM/HAM.

6.2.2 Interessment

In 1988 the new administrative information system is still a proposal; problematization does not guarantee interessment. The identities of the agencies, in terms of their problems and interests, have not been tested yet. The agencies as defined by the administrator's proposal can still reject being involved in the information system. The three agencies can either accept or reject the administrator's proposal. On the one hand UCM/HAM may deny the funds, and on the other, the project managers may decide not to use or co-operate with the system. Even the administrative personnel, although the possibility is remote, may opt out of the information system. This section concentrates on the administrator's tactics and even 'tricks' to interest the agencies on its proposal and to overcome obstacles.

We claim that the possibility of the administrative personnel of rejecting the new system is remote because as we have been pointing out in our analysis of this information system, the facilitative and dispositional power of the administrator ensure the 'interest' of his personnel in accepting his proposal. In the chapter dedicated to social integration we saw how the personnel of the administration unit were used to an autocratic style of management. Therefore, there is little ground to

expect any type of resistance emanating from the administrative personnel towards their boss requesting them to work in a new system. Likewise, in the chapter concentrated on system integration, we also saw how the administration applied disciplinary techniques, such as the evaluation, to guarantee the staff's compliance. Thus the institutionalised discipline of the administrative personnel ensures the administrator a successful interessment, at least regarding his personnel.

When the administrator proposed the new information system, his unit was struggling to cope with the demands made by project managers, especially of those in charge of the two large projects. The limited memory of the old system, only 2MB of RAM and its CEFORMAacity to deal with more than 24 users simultaneously, made the administration slow and inaccurate in responding to project manager's and assistants' requests. This situation hindered the execution of research projects and the possibility of achieving results within the stipulated project timeline. Projects were delayed in the execution of actions requiring the purchase of goods or the contracting of services. Moreover, project managers were lacking financial information. They could not know the balance of their budget, not to mention have the benefit of having a detailed statement of their accounts. Thus, when the new administrator offered the development of a new more powerful system, project managers accepted the proposal without resistance.

The administrator did not require sophisticated tactics or tricks to interest UCM/HAM in the new information system either. He presented the system as an opportunity to reduce the financial deficit and to enforce UCM/HAM administrative regulations. The deficit, as we already discussed, was of millions of dollars and the cause was deemed to be CEFORMA's unorthodox, almost maverick administrative practices. Washington could not conceive how CEFORMA's administration was able to authorise expenses without checking first the availability of funds in the budget. The administrative personnel told us, for instance, that quite often project managers would exert pressure to obtain the authorisation of transactions. The administrator presented the system as a way of controlling the expenses and curbing the impetuous managers. Thus when the administrator, both proposes the system and asks for funding, his bosses could not help agreeing and expressing their commitment to co-

operate financially. For UCM/HAM then the system is a way to save money and to strengthen its control over CEFORMA's operations.

We have seen how the interessment of the administrative personnel was taken for granted as the result the powerful and authoritative position of the administrator. The interessment of both agencies -project managers and that of UCM/HAM- was achieved through the argumentative and political skills of the administrator. He presented the system as the solution for their administrative problems. However, interest does not guarantee enrolment. We need to know how the administrator negotiated the participation of the agencies; that is the focus of the next section.

6.2.3 Enrolment

In this analysis the enrolment of agencies consists in the tactics, negotiations and tricks deployed by the administrator to forge the necessary alliances to achieve his outcomes, through the fixing of the proposed obligatory passage point, that is the new administrative information system. To fulfil a successful enrolment the administrator needs to co-ordinate the participation of the agencies and to establish, either by force or negotiation, the conditions under which those agencies will undertake their roles in the new information system. A successful enrolment would be the hallmark of a fruitful interessment. In this section we will concentrate on the negotiations and efforts made by the administrator to enrol the agencies to his proposal.

As discussed in the chapter that focuses on social integration, the administrative personnel dedicated to information systems consisted of two persons co-ordinated by the head of the finance department. The reason for having just two persons was not only because the relative small size of CEFORMA before the two large projects had not required more personnel but also because the system was running only one application, the payroll. When the administrator decided to develop the system in-house he realised that the personnel available, besides being scarce, lacked the necessary skills and expertise to develop a system like the one he had in mind. Thus he hired six professional system analysts and the former head of the computer science department of a prestigious Guatemalan university. Their role was to co-ordinate the technical dimension of the project and to be eventually in charge of

the new administrative information systems unit. His connection with academia permitted the new manager of the unit to attract bright young graduates from that university. He achieved that through wielding both CEFORMA's reputation and its favourable job conditions; he offered them full time professional positions[154]. The recruitment of the information system unit took one year; so by 1989 the administrator had enrolled a head of a unit and seven professional system analysts, all under the authority of the administration.

Even though UCM/HAM was interested in the administrator's project since he presented it, the conditions of Washington's participation had yet to be defined. From the outset UCM/HAM made clear that they were prepared to pay for the equipment -both software and hardware- installation and the salary of two system analysts and the head of the unit. The rest of the expenses had to be covered with funds originated from the project's overheads. The administrator was more than satisfied with those arrangements, and as a bonus, in addition to the reduction of the deficit by linking budget and expenses, the administrator offered to shape up the system with UCM/HAM's rules, particularly those regarding hiring of personnel and the acquisition of goods and services. This was seen as a positive strategy to check CEFORMA's maverick tendency as it would be forced by the system to follow Washington's regulations. By the end of 1989 the administrator had UCM/HAM's authorisation and its commitment to pay for a large proposition of the system's expenses.

The enrolment of the project managers did not occur as smoothly as with the other two agencies. The most difficult issue was the financial contribution that the projects had to make to the development of system as agreed with UCM/HAM. This was a source of disagreement because, by that time, project managers had started to question the efficiency of the administration in general *vis a vis* the project's contributions, an overhead of 30%. The administrator achieved the enrolment of the project managers by emphasising his offer of improving the administration's services, on the one hand, and by pledging not to raise the overhead on the other[155]. Furthermore, having obtained UCM/HAM's enrolment, the administrator guaranteed

[154]Interview key informant.

[155]Ibid.

the support of the other Washington appointee in CEFORMA, the director, whose support for the system was always tacit but real[156]. Without any control over the funds, the resistance mustered by the project managers was outflanked by virtue of the circuit of social integration -authority and membership- that sustained the position of the administrator.

The administrator achieved the enrolment of the three agencies by applying different tactics. The enrolment of the administrative personnel, composed of new and old staff, was induced by two different tactics. The new staff was enrolled by the benefits of working at CEFORMA while the old personnel were enrolled by the sheer authority of the administrator. However, the same authority would have not worked in enrolling UCM/HAM. Washington's conditions for enrolment were fundamentally economic. The enrolment tactics adopted by the administrator in this case was an argument that emphasised the financial benefits that the new system would bring for UCM/HAM. This contrasts with the enrolment of the project managers whose resistance was outflanked by the control exercised by the administrator over the overhead. The enrolment of the agencies showed the political skills of the administrator who knows how to wield both the power stick within CEFORMA and a carrot outside of it.

6.2.4 Mobilisation

The mobilisation of agencies consists, according to Callon (1986: 216), in rendering mobile agencies that were static beforehand. This definition is going to lead our discussion of how the administrator achieved the mobilisation of agencies to transit his proposed obligatory passage point. In doing so we concentrate on two aspects of mobilisation: the emergence of spokesmen and the displacement of agencies in time and space. Firstly we will concentrate on the spokesmen, particularly on how they emerged and their relationships with the agencies. Secondly, we will look at how the displacement occurred, particularly in time and space. The displacement of agencies occurs when despite being remotely located in time and space they end up represented in the information system. This is a matter of interest to

[156]Ibid.

us because when the relationship between agencies and spokesmen is strong the network of alliances and information system become stable. In short, our discussion will be centred on how the information system was the locus linking agencies that were not linked before.

As discussed above, the enrolment and interessment of the project managers occurred by a mixture of persuasion and authority. Despite paying for and consenting to the new information system, project managers still complained about how the administrative tasks were taking away much of their valuable time. Such time, they claimed, could perfectly be occupied by the technical and scientific tasks of their projects, instead of dealing with administrative matters. Consequently, the project managers designated the administrative assistants of each technical division[157] as their representatives in the meetings called by the administrator to discuss aspects regarding the new system. This way, the administrative assistants became the spokesmen of the project managers. The administrator succeeded, then, in displacing and mobilising the project managers, through their spokesmen, from their offices to his information system.

In managing the development and the design of the information system the administrator did not need to deal with each analyst individually. Instead, he gave his instructions and orders to the head of the administrative information systems unit. This way, especially in discussions about the content and purpose of the information system, the system analysts were represented by the head of their unit; they were displaced. This works to the benefit of the administrator because when he visits Washington to present and negotiate the project he speaks on behalf of the system analysts and the manager of the unit. It is in those meetings that the administrator commits himself to implement UCM/HAM's regulations and agrees the deadline for the installation of the system, at the end of 1990. The administrator, armed and shielded by a strong relationship of meaning and membership, did not only become the spokesman of the information system unit but also he managed to silence it. After all he was the administrator, the authority, their boss.

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[157]Ibid.

When dealing with UCM/HAM the administrator did not do it directly with the director of the organisation, because administrative affairs there, are the responsibility of a particular office, the administrative matters department. It was the head of this office who represented Washington in the discussions and negotiations regarding CEFORMA's new administrative information system. The circuit of social integration in UCM/HAM, that of rules of meaning and membership, determines that when treating administrative affairs this officer represents and speaks on behalf of the organisation. Consequently, it was not UCM/HAM's director but the head of the administrative matters office who supported and endorsed the project. Thus when the administrator returned from Washington and spoke about the authorisation and funds received for the new system he did it on behalf of UCM/HAM which had been mobilised and displaced by his relationship and commitments with the administrative matters officer. The mobilisation of UCM/HAM is illustrated in Figure 12.

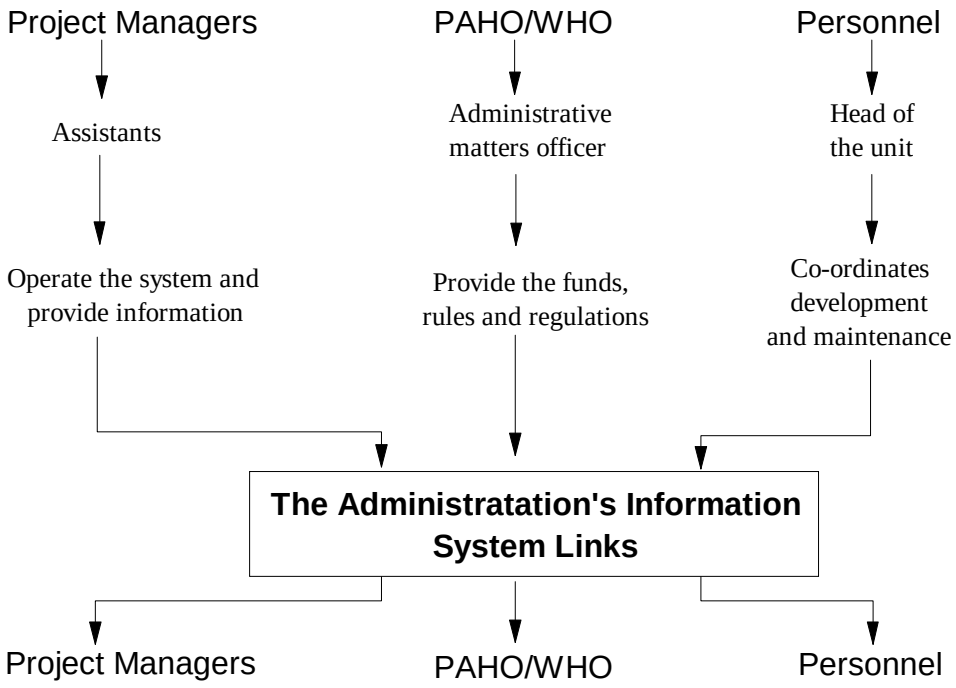

Figure 12 Mobilisation and network of alliances

The administrator succeeded in mobilising and displacing the agencies: project managers, UCM/HAM and the information systems unit. They were mobilised as the administrator ultimately did not deal with all the members of the agencies but with the spokesmen. The strength of the mobilisation and eventually that of the new information system as an obligatory passage point depends on how legitimate is the representation of the spokesmen. Therefore, insofar as the relationships remain stable

(see Figure 12) the network of alliances will be firm. The mobilisation of agencies also allowed the administrator to displace them. This is more evident in the case of UCM/HAM that despite having its headquarters in Washington D.C. managed to displace his regulations and rules to CEFORMA thanks to the information system. Likewise, the project managers and the information system personnel are displaced from their offices to the information system: the former by the administrative assistants and the latter by the manager of their unit. The mobilisation of agencies facilitated and consolidated the administrator's project who was able to install and implement the system by the end of 1990.

6.2.5 Controversies

Even though the administrative information system has been in place for seven years, there have been controversies that could have generated instability in the system. Those controversies involved the resignation of the head of the administrative information systems unit, the reduction of personnel working there from seven to only three and the dismissal of both the administrator and the administrative assistants. The survival of the information system despite all these events reveals its strength as an obligatory passage point and the stability of the network of agencies. In this point of our analysis we describe these controversies and how they were solved.

When the administrator pledged to UCM/HAM and the project managers that the new system would be installed by the end of 1990 he did put under pressure the head of the administrative information system unit and his personnel. This was a source of controversy because the head of the unit had an orthodox approach to the design and development of information systems. Consequently, instead of starting the development of the system immediately, he wanted to discuss with the users issues such as their information requirements and the design of the user system interface. Furthermore, he wanted to document the whole design and development processes with technical notes and to produce elaborate user manuals. Thus whenever the administrator discussed with the head of the unit the way to develop the system, the latter would oppose any attempt to sacrifice orthodoxy for pragmatism suggested by

the former[158]. Eventually the relationships between these two deteriorated to such a point that one day the unit's head told a mission of UCM/HAM's auditors that they -at CEFORMA- were developing a poor information system without discussing the users' information requirements and without any type of documentation.

Having learnt about the complaint the administrator regarded the unit manager's attitude as disloyal[159]. The administrator, fearing that UCM/HAM and the personnel would abandon their enrolment, took actions to keep these two agencies' interest in the system alive. On the one hand, he managed to persuade UCM/HAM's representative, who incidentally was a friend and a compatriot, to take the remarks made by the unit's head as mere exaggerations[160]. On the other hand, the administrator reacted by dismissing the manager of the unit on the grounds of disloyalty[161]. To fill the vacant position the administrator promoted, as the new manager, a system analyst who had been working in the unit. He has been the manager of the unit since 1991. He remembers that in the early days of his appointment the administrator kept telling that the dismissal of the former manager was due to his disloyal attitude[162].

This dismissal and the events before it, however, were a serious threat to the stability of the network because it could have meant the dissidence of two agencies, the information system personnel and UCM/HAM. Again it was the circuits of social and system integration sustaining the administrator's position that prevented any dissidence. It was social integration because it was his authority and connection with UCM/HAM that allowed him to dismiss the unit's manager and appoint a new one. And it was system integration, understood as techniques of discipline, that allowed him to learn the attempts of dissidence of the former manager and to let the information systems personnel know the reasons for the dismissal. The dismissal of the manager and the new appointment boosted his power position because that set a

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[158]Ibid.

[159]Ibid.

[160]Ibid.

[161]According to the e-mail with a key informant , that was the informal version commented in the corridors of CEFORMA. Officially the manager of the unit was assigned to other office -the library- to have a look at a bibliographic database. This was understood, quite rightly, by the manager as an indirect dismissal and after six months he resigned.

[162]Interview key informant.

precedent: whoever dared to contradict the administrator or to let their complaints go outside would know what to expect. However, the system gained reputation of being poorly designed and poorly documented. The controversy also showed UCM/HAM that something strange was happening at CEFORMA as the versions from senior and middle management did not correspond. That could have triggered the investigations that lead to the intervention and the dismissal of the administrator himself.

When the new administrator arrived, she faced the option of axing the information system and developing a new one. She would have had good reasons for that, first, the system was regarded as poorly designed -it was developed without consulting the users, lacked documentation, and training and testing were inappropriate. Secondly, and most importantly, it failed to deliver the promised enhanced administrative services[163]. However, the reason for not developing a new system were stronger. First there were no more funds, and second it was very unlikely that the already enrolled agencies would be interested in participating in a new system, particularly after the considerable amount of funds already spent in the system. Third, after the intervention it was clear that the system indeed helped CEFORMA to reduce its deficit. Thus, despite being the 'baby' of the allegedly corrupt former administrator, the new one decided to forget that and take advantage of a system that although criticised was already institutionalised and was serving the purpose of their bosses in UCM/HAM. Moreover, the new administrator decided to continue the development of the information system by incorporating more UCM/HAM's regulations and rules. They were deemed to be necessary if Washington wanted to increase its control over the operations in Guatemala.

CEFORMA's reduction of staff in the mid 90s could have also been a source of instability for the administrative information system. It could have affected the enrolment of the administrative personnel and the project managers. The reduction of the administrative information systems unit has been already discussed in the chapter of social integration, yet it is worth mentioning why we believe this did not affect the stability of the system. On the one hand, the system was already almost finished and, on the other, the whole CEFORMA administrative transactions of the last six years

[163]This was presented in detail in the previous chapter.

were kept in the system. The remaining personnel -two employees- were in charge of the only required task to keep the system functioning, its maintenance.

As mentioned above, the budget reduction of the 90s also hit the projects and technical personnel, particularly by triggering the removal of the administrative assistant position. When we visited CEFORMA, end of 1995 and beginning of 1996, the technical personnel were pessimistic as they were facing the imminent departure of the assistants. It was said that chaos would arise because the project managers, without being trained, would have to do the administrative transactions in a system without documentation. They simply would not be able to do that[164]. However, in recent communications we have had with administrative and technical staff the feared collapse did not occur[165]. Currently, researchers and project managers still do not operate the system; that task is now performed by the secretaries who were trained by the administration to do that job. The controversy was resolved by replacing the spokesmen for spokeswomen, the secretaries. Consequently, the network of alliances remains stable, and so does the administrative information system as an obligatory passage point.

The controversies did not imply the dissidence of the agencies. Despite facing controversy the agencies remained faithful to their participation in the information system (see Figure 12). UCM/HAM was not interested in financing another information system, especially when the current one was already institutionalised and working accordingly to the organisation's interests. The controversies generated by the reduction of personnel were resolved by replacing the spokesmen. Not even the dismissal of the administrator meant the dissidence of the rest of agencies. The institutionalisation of the system was so strong that it survived all the arguments against its defects. The lessons learnt from analysing this system will be summed up at the end of this chapter. However, this analysis of the episodic circuit of power illustrates how time boosts the institutionalisation of an information system, yet its stability depends on the agencies' willingness to remain enrolled in the obligatory passage point.

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[164]Interviews key informants.

[165]Ibid.

6.3 The Organisational Information System (OIS)

The OIS is an example of a project that failed -at least as it was conceived initially- to become an obligatory passage point. The OIS was thought to be a system that would support the new mission objective of CEFORMA[166]. CEFORMA would cease to conceive the pabulumal problems from a biological and medical perspective and would adopt instead a more holistic paradigm by considering malpabulum as having its origin in social, political and economic factors. The OIS was deemed to be a fundamental instrument for transforming the new CEFORMA. Thus senior management at CEFORMA defined the three main elements that would compose the OIS: information about the situation of education and pabulum in the region, up-to-date financial reports and a state of the art information technology infrastructure. Because our concern in this thesis has been to understand and make sense of the adoption of information systems as a political and power phenomenon, we have already discussed the circuits of social and system integration that hindered the adoption of the OIS. However, in this section we will analyse the circuit of episodic power by applying the sociology of translation, to understand how was that CEFORMA failed to materialise the OIS as was conceived initially[167].

The starting point of our analysis will be 1990 when CEFORMA takes in hand the development of the OIS. Although by the end of the 80s CEFORMA's senior management was already preoccupied with the dispersed state of their information systems (CEFORMA 1990), the idea to develop an OIS was initiated by a consultant's report (Crowther 1990). This pointed out that the information systems and applications of information technology at the organisation were "islands of information" and urged CEFORMA to integrate them. The first official declaration of the organisation's intention to develop the OIS appears in CEFORMA (1990: 76). The system was developed in house and the manager of the project was the head of the unit of dissemination of information. She -despite not having any experience in developing, designing or managing any information system- was very close to the director and had just come back with a M.Sc. in public education from a very

[166]See previous chapter.

[167]The details of the OIS, in terms of content and characteristics of the personnel involved, have been presented in the previous two chapters.

prestigious American university. The OIS was a challenge for her since she had to share her dedication to the project with her other duties as the head of the dissemination of information unit, namely co-ordinating the library and the editing and distribution of scientific material. We start our analysis with the OIS manager attempting the problematization of her project.

6.3.1 Problematization

To be prepared for her job, the OIS manager attended a series of seminars offered by IBM Guatemala in which she learnt that organisations could achieve their strategic objectives by the application of information technology and computerised information systems. These seminars convinced her that the strategies proposed by CEFORMA could be fulfilled by the application of information technology; hence her conception of the OIS. Thus in the early 90s, she envisaged a set of agencies that would potentially come together through the OIS: a group of system analysts, the technical and co-ordination units, and the other two information systems groups. Drawing mainly on Crowther (1990) and on what she learnt in the seminars, her action plan for achieving the objectives of the OIS consisted of two main projects that had to be carried out simultaneously (CEFORMA 1991a). The first project was the installation of an information technology infrastructure; that was a computer network to link the existent applications. The second project was the development and integration of the sub-systems that eventually would constitute the OIS and would run on the network. From the OIS manager's proposal we also can deduct the identity of the agencies she needs to be involved in her project. The network of alliances proposed by the OIS manager is depicted in Figure 13 and the identities of the agencies are described below.

1) Technical and co-ordination units (units): Technical units[168] are concerned with carrying out research activities while co-ordination units deal with harmonising the research processes with CEFORMA's main functions[169]. The OIS manager's proposal assumes that both types of units, technical and co-ordination, want to

[168]These were the technical divisions of the matrix organisational structure and now they are the programmatic areas of the current structure.

[169]The difference between technical and co-ordination units is explained in the Chapter Four.

achieve their research and supervision goals, therefore, she expects they will welcome a strategic information system such as the OIS.

2) The administrative information system: This agency is composed by the group working in the administrative information system unit and the administrator who has an absolute authority over the system. This system's function is to control CEFORMA's expenses in order to avoid financial deficit. The OIS manager's assumes and expects that this system will be enriched by being integrated with a strategic information system.

3) The statistical computing unit: As discussed above, the interest of this agency, composed of programmers, clerks and researchers, is in support of research projects with statistical computations. This agency would also respond favourably -at least according to the OIS manager- to being engaged in the design and development of the OIS.

4) The OIS personnel: The members of this group had been working with one of the large projects and they were told their new duties as developers of the OIS in 1990. They were young and found the work at CEFORMA exciting and rewarding, so the OIS manager assumes quite rightly, that they will not put up resistance to participating in the OIS.

The definition of the obligatory passage point: The OIS manager articulates the obligatory passage point for the above agencies in the form of *if* propositions: (1) if the technical and co-ordination units want to achieve their supervision and research objectives; (2) if the administrative information system is going to offer strategic financial information to its users; (3) if the statistical computing unit wishes to keep supporting research and (4) if the personnel assigned to the OIS project want to keep their jobs at CEFORMA. If all those agencies want to achieve their goals, as described in the above four propositions, they have to participate in the design and development of the OIS, and most importantly they have to use it. The agencies would like to do that because the OIS will be a system containing a infrastructure for integrating all CEFORMA's PC's; it will also present the situation of pabulum, food and education of the Central American people; it will provide up-to-date financial information. If the OIS manager's programme is accepted by the agencies, she and the OIS will become indispensable.

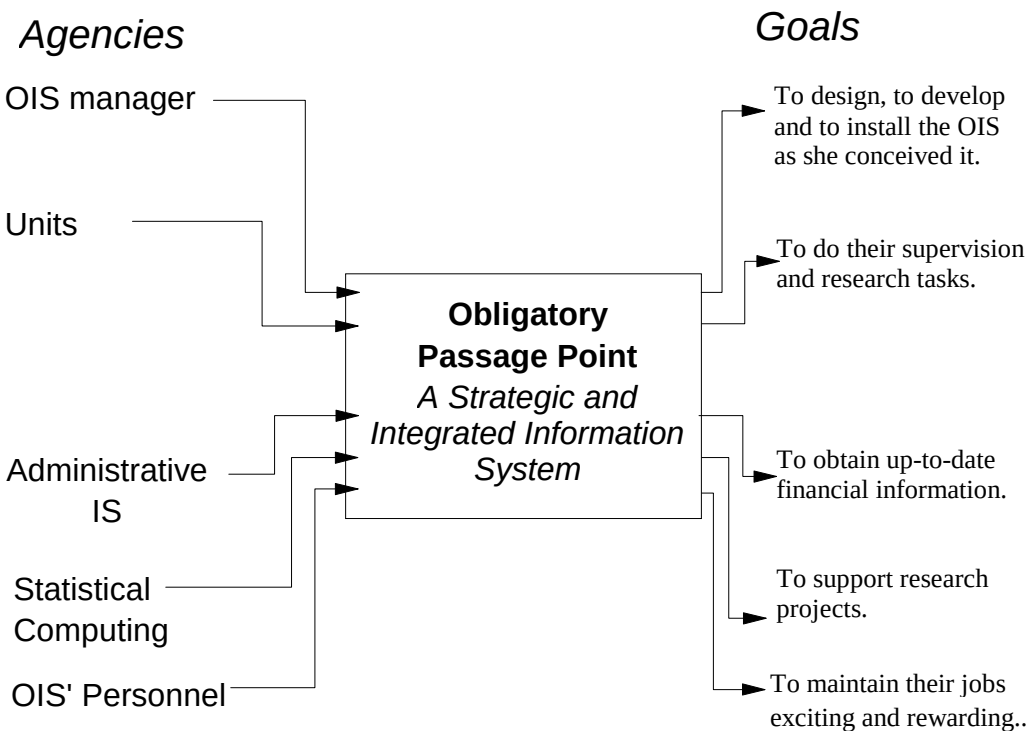

Figure 13 Problematization of the organisational information system

6.3.2 Interessment

The statements and propositions of the problematization are all hypothetical because they have not yet been tested: a successful interessment will resolve the *ifs* of the problematization propositions. Interessment when successful, besides consolidating the identities of the agencies as proposed in the problematization, interposes devices to isolate the agencies from potential competitors. In other words, if the OIS manager wants to interest the agencies in her project, she has to counter the action of competitors, particularly those offering the achievement of the agencies' goals through transiting different obligatory passage points. In fact, she failed in doing that, her problematization did not yield interessment. In this sub-section we will focus on her efforts to interest the agencies.

The interessment of the units was fundamental for the success of the OIS in two ways. Firstly, the units would contribute with expertise and information, and secondly they would be the main users of the system. The OIS manager assumed that the units would accept her proposal because they wanted to improve the performance of their jobs and that the OIS would provide the information to do so. Her tactics to

interest the units were on the one hand, to invite their heads and members to a series of the aforementioned IBM seminars and, on the other, to emphasise the importance of the OIS in formal and informal meetings. Despite her efforts, the units did not develop interest in the system as our data showed in the two previous chapters[170]. For them the OIS was only a network of computers and did not represent an instrument by which achieve their goals. The OIS manager's problematization, from the point of view of the units, failed because it did not show that they had a problem, so they rejected the proposal of the OIS as an obligatory passage point.

The interessment of the units was not the only one that failed, that of the administrative information system and the statistical computing failed as well. The reason was similar to that discussed above. The administration did not require the OIS for providing up-to-date financial information; they had it already in their own system. Moreover, the main problem experienced by the administration was to control CEFORMA's expenditure and to reduce the financial deficit. In this context, the offerings of the OIS were meaningless. The statistical computing group did not need the OIS for supporting the research projects either. Its main function was to provide computational support to research projects. As discussed above, by 1990 this group was facing a problem -its survival- which the OIS did not address. The other elements of the OIS, the bibliographic database and that of the situation of food, pabulum and education were also alien to the main tasks performed by these two agencies. The only component of the OIS that interested them was the possibility of a computer network offering access to software packages such as WordPerfect, CCmail and Netscape. Currently, this network is the only element of the OIS being used by CEFORMA.

The interessment of the group of system analysts assigned to develop the OIS occurred as the result of the OIS manager's authority and the support from the director. It was CEFORMA's director who authorised her to take over the management of the group [171]. Although the director did not put it this way there were not many options for the system analysts, the members of the group either accepted

[170]Researchers pointed out that the so called OIS was only a network of computers. Interviews with key informants.

[171]Interview key informants.

their new duties or had to face leaving their jobs. It was clear for them that the two large projects had finished and if they wanted to stay in the organisation they had to undertake the OIS tasks, because ultimately it was this project that would pay for their salaries. The OIS manager's problematization assumed that the system analysts would accept the director's authority and would think of the OIS as a way to achieve their goals of securing their jobs. Although they had problems in adapting, the whole group undertook the development of the OIS. For them the problematization made by the OIS manager was successful, at least during the first year of the project.

The OIS manager's problematization did not succeed completely in interesting the agencies. The units and the other information system were interested in the possibility of having access to the computer network, but failed to see the information subsystems as a solution to their problems. The one that could have interested them, that of the pabulum, food and education situation, as several of our interviews revealed[172], was not suitable for a database format mainly because the data sources were dispersed and unstructured. Consequently, the units did not appreciate the benefit in using that database or a bibliographic one[173]. Likewise, the offering of up-to-date financial information did not raise the interest of the agencies mainly because they knew that -when required- the information would be in the administrative information system. The only agency who thought of the system as solving one of their problems -unemployment- and therefore was interested in participating in the development of the OIS was the group of system analysts. However, the OIS manager's interessment and problematization did not fix her proposition of the OIS as an obligatory passage point.

6.3.3 Enrolment

We already described how the interessment and enrolment of the OIS personnel were achieved as the result of both the authority of the director and the concern of the system analysts to preserve their job. We could say that the enrolment of this agency was achieved through force. That could not have been deployed over

[172]Ibid.

[173]This was revealed to us by the librarian in the foregoing chapter.

the other agencies as the OIS manager did not have any authority either over the units or the other two information systems groups. Therefore, if they were to be enrolled, it had to be the result of negotiations. The enrolment of the units would have consisted in their being willing to use the system and to collaborate with its department. The enrolment of the other two information systems -administrative information system and statistical computing- had consisted in their acceptance to submit to the authority of the OIS manager. We know that neither of these two agencies, units and information systems groups, were enrolled. In this part of the thesis, we shall discuss the way the OIS manager attempted the enrolment of those agencies and we shall also attempt to make sense for the failed enrolments in terms of politics and power.

The enrolment of the units failed mainly because the units did not see that the OIS was solving any of their information problems. The problems the OIS were addressing had already been tackled by its competitors. The competition for the use of the OIS as a source of strategic information came from different sources, namely documents, conversations, formal and informal meetings and the administrative information system. Likewise, the units did not see that committing themselves to the development of the system was an appropriate investment as they had their resources engaged in performing the core tasks of their functions. To enrol the units to the OIS, its manager organised meetings and workshops where the units had the opportunity to express their information needs and requirements (Clark 1993). Her intention was to incorporate their observations into the system so they would perceive it as useful. However, the information problems and requirements of the units were outside her scope of action as they involved chiefly financial and non structured information[174]. Thus the enrolment and interessment of the units to the OIS were hindered by competitors: other sources of information and more relevant tasks. Had she managed to offer in the OIS a solution for the units' problems, they might have enrolled in her project.

CEFORMA was put under pressure to integrate its different information systems groups. Consultants (Crowther 1990, Gonima et. al. 1993, Herrera 1991, 1992, 1993) hinted that if CEFORMA wanted to install successfully the OIS the

[174]See footnote 170 in this chapter.

different information systems groups should be integrated under a single authority. This would allow the OIS group to increase its work-force and to have access to the information kept by both the statistical computing group and the administrative information system. The suggestion of integration had more force because it was received from consultants and evaluators of the ISP (Gonima et. al. 1993, Herrera 1991, 1992, 1993) that was the source of funds for the OIS project. However, to enrol the two information systems groups the OIS manager needed to convince the administrator and the researchers to give up their information system, information technology applications and personnel under her authority.

The OIS manager's chances of enrolling agencies were never as unlikely as they were in the case of the administrative information systems group. The administrator did not accept the integration of her information system group because it was the administration's budget that paid for the salaries of its personnel. Consequently, they were engaged in maintaining and developing the administrative information system. Her tactics would have required someone with authority over the administrator to order her to give up the control over her personnel. That person with authority could have been the director. However, the director had never had a strong control over the administrator since this position was appointed by UCM/HAM and not by him. Without the support of the director the OIS manager's attempts to enrol the administrative information as a subsystem of the OIS failed.

The case of the statistical computing unit revealed similar difficulties for the enrolment. The integration of the statistical computing group failed, as with the administrative information system personnel, chiefly because of a financial reason: the salaries of the personnel were being paid by specific projects. Hence a move to allow the OIS manager to have authority over that group would have been opposed firmly by the researchers. Furthermore, the skills and know how of the statistical computing personnel were not attractive for the OIS manager, since its speciality was very specific: processing and analysing research data. She would have welcomed more versatile personnel with expertise more related to the tasks required to develop the OIS such as knowledge on computer networks, system analysis, programming and design and maintenance of databases. In this sense the statistical unit personnel did

not see the OIS as a resource to achieve their major goal: securing their job at CEFORMA.

The only successful enrolment achieved by the OIS manager was that of the personnel assigned to her by the director. She controlled the budget covering their salaries and they were under the authority and scope of actions of the director. However, she failed in enrolling the units and the other two information systems groups. Besides not having authority over the units, she failed in convincing them that the OIS would provide them with valuable information. Consequently, they were not interested in either using or developing the system. The enrolment of the other agencies, namely the administrative information system and the statistical computing group, was not consummated because they were not under the OIS manager's authority. Moreover, their enrolment would have meant relinquishing other relevant tasks for the organisation, i.e. administrative and research projects. Thus, with those agencies refusing to join the OIS manager's programme, her problematization as depicted in Figure 13 was doomed to be a failure.

6.3.4 Failed mobilisation and dissidence

To analyse the mobilisation of agencies is to analyse the processes by which these agencies end up being represented by spokespersons. This is relevant especially when a network of agencies has been created and an obligatory passage point has been fixed. The stability of both, network and passage point, will depend on the stability of the relationship between spokesperson and agency. In the case of the OIS, its manager failed to consolidate the three previous steps of translation, so there were no agencies either interested or enrolled in her project, at least not in the way she foresaw it at the outset of the project. Therefore, our discussion of the mobilisation of agencies could not be focused on the strength of the network and the stability of the OIS as an obligatory passage point; they did not exist as such. Instead, we will concentrate on pointing out who were the spokesperson of each agency and when and how they rejected involvement with activities related to the OIS. In short, the focus of our analysis here is the relationship between spokesperson and OIS not that of the spokesperson and agencies. To do so we will follow the dissidence of the

spokespersons from the steering committee of the OIS; this epitomises the agencies' dissidence towards the OIS[175].

Two agencies made clear their reasons for stopping their participation in the steering committee: the statistical computing group and the units. The spokesman of the statistical computing group was its manager. He admitted that the matters discussed in the committee were irrelevant for their work so he decided not attend the meetings any more[176]. The units were represented in the committee by their heads. In the first meeting they were asked by the OIS manager to prepare a plan for the development of their respective subsystems. The units lacking expertise in designing and developing information systems came back to the next meeting, two weeks later, asking for support from the committee for the design and development of their subsystems[177]. They asked the committee to designate system analysts and programmers to assess the needs of strategic information for each unit[178]. However, all system analysts were already engaged in other tasks and their bosses, as we discussed above, were not interested in allowing them to take over other tasks. This discouraged the units, which gradually stopped participating in the committee[179]. The other factor that might have encouraged these two agencies to withdraw from the committee was the absence of the director in the committee meetings[180]. He only attended the first three[181]. Without the authority figure of the director and unable to provide support to its members those two agencies opted for dissidence rather than for mobilisation.

The only agency that supported the OIS manager's proposal was her personnel. However, even this did not occur without conflict. The conflict occurred between she and the middle managers of the group. From 1990 to 1997 there have

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[175]The OIS steering committee was created to provide the system with a multidisciplinary view and to advise the director on the activities regarding the OIS (CSI 1992a). We have already discussed in the previous chapter the failure of the steering committee in achieving its objectives. The committee is mentioned in this section only to discuss the failed mobilisation and the dissidence of the agencies.

[176]Interview key informant.

[177]The reports of each meeting are in CSI (1995a, 1995b, 1995c).

[178]Ibid.

[179]Interview key informant.

[180]Interviews key informant.

[181]See footnote No. 177.

been three different middle managers. The first one resigned after confrontations with the OIS manager and realising that he did not have any discretion over the management of his group. He resisted the OIS manager's autocratic style of management that seemed to be the source of several heated arguments[182]. Eventually, he decided to leave when he saw his position advertised in a local newspaper. The next middle manager also abandoned the project as the result of controversy. He left after a year of not receiving the promised when benefits he was hired: being regarded as core professional staff. After his resignation a new middle manager was appointed, he was promoted from being a system analyst to the position of middle manager. The frequent turnover in this position did not favour the mobilisation of the OIS personnel. Nevertheless, it was the authority that the OIS manager had over this group -she could replace her staff almost whenever she wanted- that made the OIS personnel agency and its spokesman remain loyal.

Although the administrative information system did not enrol fully in the OIS manager's project, it was constantly represented in the committee meetings[183]. The spokesman of this agency was the manager of the administrative information system unit who was present in every meeting of the committee[184]. His participation benefited the administration in three areas. Firstly, the administration was interested in the funds available in the budget of the OIS to buy new workstations for the administrative staff; the purchase was carried out in 1996[185]. Secondly, the administration wanted the OIS to pay for the upgrading of its network from Arc-Net to Ethernet. This was achieved in 1995 (CEFORMA 1995). Thirdly, they were interested in the committee's support to legitimate CEFORMA's adoption of UCM/HAM's regulations for the acquisition of information technology. The administration sought the support of the committee on this matter as the researchers' complaints about the excessive controls exerted by the administration were widespread. The administration was successful in achieving support from the OIS on those three matters, yet the OIS manager still fail to achieve her objectives.

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[182]Ibid.

[183]See footnote No. 177.

[184]Ibid.

[185]E-mail key informant.

When CEFORMA outlines the achievements of the OIS, it points to the computer network, the implementation of standards for acquiring equipment and the physical integration of the administration network[186]. In all these achievements the administration was an ally of the OIS manager. Despite those achievements, CEFORMA's director and those researchers interviewed did not consider the networks and the available software packages as the OIS[187]. The dissidence of the units and the reluctance of the administration to concede its resources suggest the OIS manager's political inability and lack of power to consolidate the first three steps of translation: problematization, interessment and enrolment. The reasons given by the agencies' spokesmen to relinquish their participation in the steering committee epitomise the OIS manager's failure to interest and enrol agencies. The director admitted that he left the committee because it was focused only on technical aspects; and the same reason was given by the units. The statistical computing managers told us that he left the committee because the meetings were irrelevant and that he was very busy with his research projects. And the administration saw the OIS as a source of funding and legitimation for its own projects. Today, CEFORMA has a computer network and two system analysts as the legacy of the OIS. This is very far from the strategic objectives set for the OIS in 1990. We believe that if CEFORMA ever wishes to re-launch the OIS project, it might need to start over with the translation of interests and the creation of a network of alliances.

6.4 Conclusions

This chapter focused on the episodic circuit of power for each of our sub-units of analysis: the statistical computing unit, the administrative information system and the OIS. We concentrated on the political manoeuvres and tactics adopted by particular agencies to interest and enrol other agencies in their programme. To discuss and analyse the episodic circuit of power we drew on the sociology of translation as explained in Chapter Three. The purpose of using this analytical tool was, on the one hand, to identify whether and how the information systems under study became

[186]This is reported in CEFORMA (1995) and it was confirmed by our interviews.

[187]Interviews with key informants.

obligatory passage points, and on the other, to discuss the power factors that contributed either to stabilise or unsettle the obligatory passage points. In other words, we discussed the institutionalisation of the systems. Each of the sub-units of analysis showed different characteristics.

The institutionalisation of the administrative information system, for instance, depended on the political ability and authority of the administrator to enrol other agencies to his project. By contrast, in respect to the OIS, its manager could neither interest nor enrol other agencies but only those under her scope of action, namely her personnel. Likewise, the influence of exogenous contingencies in the adoption or the refusal of the use of an innovation is illustrated by the creation and gradual disappearance of the statistical computing unit. The summary of the analysis of the episodic circuit is shown in Table 22 and Table 23. The former centres on the information systems as obligatory passage points while the latter on institutionalisation.

Table 22 Information systems as obligatory passage points in the circuit of episodic power

Information System	Proposition as an OPP	Agencies Proposing it as an OPP	Agencies that had to be enrolled	Desired Outcomes
Statistical Computing Unit	The cure of malpabulum requires positivistic research on large populations supported by statistical computing	Researchers	Donors, governments and personnel	To contribute to knowledge and the eradication of malpabulum.
Administrative Information System	The reduction of deficit, increase of control and enhancement of services requires a centralised information system	Administrator	UCM/HAM, project managers and personnel	To reduce the financial deficit and to enhance the administrative services.
OIS	CEFORMA's strategic plan can only be enacted successfully with an integrated strategic information system.	The OIS manager	Units, statistical computing, administrative information system and personnel	To support CEFORMA's strategic planning.

Table 23 The institutionalisation of the information systems and its relation with episodic power.

Information System	Proposing Agency's standing conditions	Extent of Institutionalisation	Status by August 1997
Statistical Computing	There were available funds for positivistic research. Governments and donors were willing to collaborate with research.	It became institutionalised as positivistic research required increasingly more statistical computations. The accumulation of data made it	It became dispensable as the result of exogenous contingencies: end of the cold war, scarce funding and a shift in

	Researchers had good reputation.	indispensable for longitudinal research.	CEFORMA's research policy.
Administrative information system	The administrator had the support from UCM/HAM who paid for the system. The administrator had control over administrative processes and his staff.	It became institutionalised as it was the only way for the researchers to carry out the logistics of their projects. Its continuous use made it indispensable as staff was used to it and all the financial data were stored in it.	The system is in place and it is indispensable for CEFORMA's operations.
OIS	The OIS manager had the full support from the director and the funds available from the US for the development of the system. She had absolute authority over her personnel. She lacked authority over the other agencies.	The only institutionalised elements are the computer network and the regulations for the acquisition of information technology. The strategic elements of the system were not used; let us not say institutionalised.	The computer network has become indispensable for internal and external communications, yet the databases and customised systems are not being used.

6.5 Closing remarks about the case study

We shall conclude now the discussion and analysis of our main case in this thesis. We do that by summing up the main findings for each of the three information systems under study according to the respective three circuits of power (see Table 24). Our analysis of the statistical computing unit suggests that strong integration in the circuits of facilitative and dispositional power is a favourable factor for the adoption of an innovation. However, those factors do not guarantee that the innovation will become an obligatory passage point. That will depend mainly on the political ability of the agency proposing it to deploy his or her resources to either convince of force other agencies to enrol in his or her proposal, if they want to achieve their desired outcomes. The positioning of the administrative information system as an obligatory passage point shows that an information system with low social integration can still become stable. This may occur if the low social integration is compensated by high system integration and if the agency proposing the system as an obligatory passage point has enough authority and resources. Authority and access of resources depend on the agency's position in the organisation. However, an agent can manage to acquire and control resources through negotiation, persuasion or even force. In the case of the OIS its manager failed to do so.

Table 24 The circuits of power of CEFORMA's information systems

Information	Social Integration	System Integration	Episodic Circuit

System			
Statistical Computing	High social integration. The managerial style of the researchers suit the rules of meaning and membership of the personnel.	High system integration. The personnel learnt the required skills to operate the system. They worked with autonomy and self discipline.	The researchers managed to enrol, interest and mobilise the donors, governments and personnel. The network of alliances remained stable until the influence of exogenous contingencies.
Administrative Information System	Low social integration. Administrative personnel showed dissatisfaction with the style of management.	High system integration. Designers adapted regulations to the system and staff learnt how to use it. The administrator outflanked resistance from his personnel.	The administrator managed to persuade UCM/HAM. Its position as an obligatory passage point for the utilisation of money forced the enrolment of the project managers.
OIS	Low social integration. The OIS personnel did not adapt to their manager autocratic style. Personnel were also dissatisfied with their status as members of staff.	Very low. The OIS was not linked to the units' core tasks and research activities. It was very low also in forcing other agencies to join her programme. It was high regarding the way the OIS manager disciplined her personnel.	The OIS manager failed in interesting and enrolling other agencies. She lacked the authority, resources and political ability to force or persuade the other agencies to accept the OIS as an obligatory passage point.

Likewise, the institutionalisation of both the administrative information system and the statistical computing unit shows that when the innovation becomes an obligatory passage point and this situation is sustained through time then the innovation is very likely to be institutionalised. By contrast, the failure of the OIS in becoming an obligatory passage point shows that low system and social integration plus a non favourable standing conditions for the agency proposing it may hinder the adoption and ultimately the institutionalisation of an information system. Although the analysis and discussion of this case study finishes here we will examine the main findings in the next chapter. Our concern will be how these findings relate to current understanding about information systems.

Chapter Seven

Conclusion

The purpose of this research was to understand why information systems are adopted and subsequently institutionalised. Its motivation was to make sense of how it is possible that poorly designed information systems can be adopted and institutionalised. We argued that the adoption and institutionalisation can be understood from a political and power perspective. In doing so, we adapted and interpreted Clegg's circuits of power to the field of information systems. This closing chapter summarises in the first section our main findings and contributions. In the second section we discuss the theoretical and practical implications of the research. In the third section, we discuss the limitations both of the research design and of our framework. We finish the chapter by suggesting areas of further research.

7.1 Overview of the Dissertation

The literature review in Chapter One showed us that power and politics play a relevant role in the relationship between information systems and organisations. It also allowed us to classify the different approaches according to their focus. The notion of institutionalisation adopted from organisational studies and sociology guided us in clarifying our research question: to study, from the power and politics point of view, how information systems become stable.

Our analyses of the different types of power helped us in identifying different issues that could be of interest for the purposes of our research. From works concentrated of 'power over', for instance, we learnt how insightful sociological approaches combined with interpretive research can be used to understand political

aspects of information systems. By focusing on language these works suggest that the differentiation between what is technical and what is social is a matter of power. However, they lack a consideration on how information systems become stable and institutionalised. Our study of 'power storage' took us to consider contingency and resource dependency theories. These theories have been applied to test the hypothesis that because of their centrality and control over resources, information systems in organisations have to be powerful. Despite having explanatory force, the limitation of these approaches is mainly that they do not consider the power exercised by individual agents. We learnt from these works and their criticism that research on power and information systems should also give an account of the power exercised by individual agents and not only by groups.

The first part of Chapter Two, which discussed meta-theories that combined with interpretive research, touched upon issues of power and information systems. By discussing these meta-theories, namely critical theory, hermeneutics and structuration theory, we saw that none of them account in detail for the components that constitute power relations. The contribution of these theories, though, consists in highlighting the relevance of power in the interaction between information systems and organisations. We realised that these theoretical approaches to the study of power and politics of information systems did not include the different types of power conceived by social scientists. Furthermore, these meta-theories did not point to the specific data required to conduct research on power and information systems. The literature review on the one hand and the examination of macro-theories applied to interpretivist research in information systems on the other, helped us to identify areas where our research could make contributions.

Chapter Two also presents the philosophical assumptions underpinning our research. These correspond to the epistemological and ontological assumptions of interpretive research. Our confidence in the interpretive approach was not only the result of our personal belief but also a result of our examination of previous works on information systems and power. These works examined in Chapter One showed how insightful an interpretive approach can be in studying power relations and the politics of information systems. The main strategy we adopted for the development of our argument was to conduct two case studies. One re-interpreted from secondary sources

and the other, the main case, an in-depth embedded exploratory case study. The former helped us in examining the links between theory and data so we could conduct our main case with a better understanding of the theory and in pointing up the data we needed to conduct it. Chapter Two also presents the research design in detail as well as the data collection techniques employed when conducting the case studies.

Chapter Three introduced the circuits of power framework. In doing so we introduced and discussed Clegg's notion of power and the elements of the framework. We also described in the first part of the chapter what according to us should be the data that a researcher applying the framework should collect for each of the circuits. In the second part of the chapter we introduced the case of the computerised ambulance dispatching system of the London Ambulance Service. This case was instrumental for testing and 'fine tuning' the circuits framework. It showed how when analysing power relations both social and system integration are relevant for the institutionalisation of information systems. Moreover it illustrated how exogenous contingencies may affect the integration of the circuits.

Chapters Four, Five and Six concerned our main case study. Chapter Four introduced the organisational background and the circuit of social integration. We discussed how exogenous contingencies such as the end of the cold war affected the organisation. We identified the rules of meaning and membership and the formal and informal structures of authorities. These were fundamental in understanding not only the context of the information systems but also the politics of the organisation. Chapter Five focused on the circuit of system integration. It described the major productive activities of CEFORMA as well as the techniques of supervision. The analysis of this circuit allowed us to establish the relationship between our three sub-units of analysis and CEFORMA's techniques of production and discipline.

Chapter Six analysed the episodic circuit of power and closed the main case study. To discuss and analyse the circuit of episodic power of our sub-units of analysis we drew on the sociology of translation. We concentrated on the manoeuvres and tactics deployed by particular agencies to create alliances with other agencies. That process was analysed by following the four steps of translation: problematization, interessment, enrolment and mobilisation. We discussed how the network of alliances necessary for the institutionalisation of the sub-units of analysis

depended on the success of the four steps of translation. The results of these analyses are interesting. For example, the administrative information system was institutionalised, despite being poorly designed because it was sustained by the network of agencies created by the administrator. The statistical computing unit disappeared when exogenous contingencies affected the interests and roles of the agencies involved in the network of alliances. The organisational information system (OIS) failed to reach its full potential as its manager was unable to consolidate the circuit of system integration required to enrol the other agencies in the network of alliances. Besides showing how the sociology of translation can help us to make sense of power relations and the network of alliances that sustains them, this dissertation claims other contributions. These are introduced in the following section.

7.2 Contributions

This section focuses on the contributions of the dissertation. We can group our contributions into three categories: theory, research methodology and practice. These categories correspond to each of the three parts of this section. In addition to introducing the contributions we also discuss their implications for each category.

7.2.1 Theoretical contributions

The theoretical contributions of this dissertation can be classified into two areas. One is in interpreting Clegg's work to the field of information systems and the other is to the body of knowledge of information systems. The contribution to our field of studies is not only the framework itself but the findings obtained by applying it to our two case studies. Our interpretation of Clegg's framework may also be considered as a theoretical contribution to our field, as it can be used for the study of power and politics of information systems. Although emphasising institutional factors, the framework makes a link between the context and processes of organisations. Both theory and findings make contributions to our understanding of how organisations adapt and institutionalise information systems.

Our findings suggest that the institutionalisation of an information system is favoured when the system is integrated with the core productive activities of the

organisation, i.e. system integration, as illustrated by the case of the statistical computing unit. Hence the likelihood of a system to be institutionalised and adopted increases when the job task the system is automating or supporting can be clearly elicited. The OIS, a strategic information system, failed to be institutionalised. We found that CEFORMA's overall strategies were stated in more general terms than the operational procedures so the system integration of its strategic system was more difficult to achieve than that of the productive operations, namely the administrative information system and statistical computing. The clearer the task to be automated or supported the greater the likelihood an information system will have to achieve system integration. That suggests why the only component of the OIS adopted and institutionalised was the LAN. The LAN's specification was very clear.

However, as it was shown by the analysis of the circuits of episodic power and that of social integration, system integration is not the only condition for the institutionalisation of information systems. The analysis of the circuit of episodic power showed the relevance of agencies' networks and agencies' political manoeuvres. That is why the circuits framework provided an answer to our initial question of why even "poor" information systems may be adopted and institutionalised. This was illustrated by the institutionalisation of the administrative information system. We learnt from this system that when those owning the system hold a powerful position, then what is essential in the system is not user satisfaction but owner satisfaction. Moreover, if the users lack authority and facilitative power to resist, then the system may be institutionalised. The administrative information system also illustrated that institutionalisation may occur even if a system is not well designed in the view of the users. This may occur when the system, as in the case with the administrative information system, is posed as an obligatory passage point for the acquisition of resources. In other words, an information system may become an obligatory passage point when it has to be transited to obtain resources. This suggests how the adoption and institutionalisation of information systems can be politically driven.

In Chapter One we stated that a theoretical framework attempting to make sense of institutionalisation and adoption of information systems should also account for their non adoption and non institutionalisation. The circuits framework not only

accounted for the institutionalisation of information systems but also for their non-institutionalisation. It accounted for the non-institutionalisation of the LAS and that of CEFORMA's organisational information system. The former failed mainly in achieving system integration while the latter failed chiefly in creating a network of alliances for the strategic elements. In this sense we showed how our work may be applied to identify and to understand the power factors that influence the failure of information systems. This is because power and politics are deemed as major factors for failure in the literature that concerns information systems failure (see Drumond 1996; Flowers 1997; Hart 1997; McGrath 1997; Mitev 1996; Mitev 1997; Rada 1997; Silva and Backhouse 1997; Warne 1997).

An interesting case occurs when an information system is abandoned after having been institutionalised. Our findings suggest that this may depend not totally on system integration but on the withdrawal of agencies constituting the network that sustains the system. That was what happened in the case of the statistical computing unit, which despite having strong system and social integration, was abandoned as the result of the withdrawal of agencies. The agencies' withdrawal stemmed from exogenous contingencies, in this case the end of the cold war. Thus, our research suggests that in every institutionalised information system there is a network of agents that makes the system stable. The system will become unstable when agents withdraw from their roles.

Understanding power as circulating in three different circuits can help to understand, for example, different interpretations of the LAS information system. Beynon-Davies suggests that by using a participatory methodology and a socio-technical approach the system would have not failed, while Hougham suggests that the system collapsed because of poor project management. One interpretation emphasises social integration whereas the other stresses system integration. Our research suggests that both circuits need to be integrated, although in some cases integration in the system circuit can compensate the lack of integration in the other. For example, social integration alone is not enough to guarantee the adoption of an information system. In the two case studies, system integration seemed to be more relevant than social integration. System integration, that is the match between job tasks and the information system, on the one hand, and the control and discipline of

the resources -human and material- on the other, seemed to be more relevant than social integration. At least that was the case for the LAS and CEFORMA.

The analysis of the circuit of social integration in the organisational information system showed how CEFORMA's organisational structure did not favour the dispositional power of the OIS manager. She required the participation of the other units, yet she did not have the authority to command them nor was able to construct discourses to convince them. In the case of the OIS the analysis of the circuit of social integration showed how the group in charge of this group had difficulties in adapting to the autocratic style of their manager. However we would not suggest that the failure to be institutionalised was the result of this situation. The lack of social integration was compensated by the facilitative power and authority of the OIS manager. This indicates that a lack of social integration can be compensated by strong system integration. Furthermore, we found by drawing on the circuits framework that institutionalised information systems may be vulnerable to exogenous contingencies. The circuits framework, then, may also be used as an instrument to analyse the interaction between the external organisational context and the organisation itself. In the analysis of our two case studies we saw for example how government policies, in the LAS, and international political situation, in CEFORMA, affected decisions that influenced the outcome of the systems.

The application of the sociology of translation to analyse the circuit of episodic power allowed us to identify other contributions. By following the four steps of translation, problematization, interessment, enrolment and mobilisation, we will point out those contributions. Let us begin with problematization and interessment. These steps indicate that agencies will form alliances and will be enrolled in information systems if they perceive them as the solution of one of their problems. We learnt this when we analysed the problematization of the OIS. Its manager failed in persuading the other departmental units that the OIS would solve one of their problems. This hindered the progress of the project because, as the theory suggests, the success of the other three subsequent steps of translation depends on a successful problematization.

Interessment is also a fundamental step for an information system to become adopted and institutionalised. This is particularly important when the agency

proposing the system lacks facilitative and dispositional power. The success of the interessment will depend on the ability of the agency proposing the system to translate the interests of the other agencies onto the system. Likewise, the agency proposing the system needs to counter competitors seeking the support of those agencies required to join the proposing agency's project. As our main case study showed, the OIS manager failed in achieving successful problematization and interessment, while those of the statistical computing unit and administrative information system succeeded.

Once the system has been defined as a solution for a problem and the interest has been raised of other agencies, the agency proposing the system has to enrol and mobilise those other agencies to his or her project. The agency proposing the information system may enrol other agencies either by force or persuasion. The former can be deployed when the agency proposing the system has the dispositional or facilitative power and the latter when the agency proposing the system lacks power. Whatever the case, agencies need resources and authority to negotiate or force the enrolment and mobilisation of the other agencies. Agencies with political skills may be able to marshal resources. Yet, when agencies' positions are not sustained by strong circuits of power, they may obtain the resources and support they need by convincing or persuading other agencies. This was illustrated in the adoption of the administrative information system and institutionalisation of the statistical computing unit. In both cases, those proposing the systems were able to persuade UCM/HAM and the US government to provide resources and to support their respective project.

The above paragraph suggests that attention should be drawn to study how developers and managers communicate with users and the rest of the organisation. Power can be exercised by wielding symbolic resources such as language (see Bloomfield and Best 1992; Bloomfield and Vurdubakis 1994; Yakura 1992). These works illustrate how is that consultants and providers manage to sell their products. This was the case when IBM salespersons persuaded CEFORMA's senior management to embark on the development of a strategic system. Thus we suggest that by understanding the steps of translation, managers and users of information systems may be prepared to deal with providers and consultants in a more even manner. This is because information systems professionals have an advantage over

users since the latter lack in-depth knowledge of information systems (Markus and Bjorn-Andersen 1987).

Although some research has been focusing on how organisations in developing countries adopt and use information technology (see for example Austin 1990; Bhatnagar 1992; Lind 1990; Walsham 1992; Walsham, Symons, and Waema 1990), very little has been done on Latin American organisations (see Montealegre 1994; Silva 1989; Silva 1995). However, none of those focusing on Latin America have had as their main theme the political and power factors that hinder or boost the adoption and institutionalisation of information systems. Montealegre (1994) concentrates on the managerial aspects of adoption while Silva (1989) looks at software development as a feasible activity for Latin American countries. Although Silva (1995) discusses the power relations between developed and developing countries in the adoption of information, he does not discuss or examine the internal politics of the organisation under study. Thus our main case study allowed us to enrich our understanding of Latin American organisations.

Finally, our research suggests that, by focusing on the institutional dimension of information systems and organisations, the circuits framework represents an alternative to contingent and resource dependency approaches. This was illustrated in the LAS case study. According to contingency and resource dependency theories the LAS manager should have succeeded in introducing the information system. In contrast to those theories, the circuits framework suggests that being in a position of authority and having access to resources are not enough for an agency to achieve his or her desired outcomes when introducing an information system. We may know this by intuition, yet one of the contributions of this research is to provide a theoretical framework to understand and make sense of what we know as a result of our day to day experience.

7.2.2 Methodological contributions

The contributions of this dissertation to research methodology on information systems are linked to those drawn from the theory. Our case studies illustrate how to apply the framework and the type of data required to study power for those researchers interested in using the theory. We believe that by using the cases as

examples and the guides for data collection and interviewing (see Appendix One) this research could be replicated. In addition we believe that our experience with the case study methodology and the techniques we applied for collecting data may be useful for other researchers studying power and politics in organisations, whether or not they apply the circuits framework. The rest of this section discusses those contributions.

Barnes (1988) warns us about the problems of researching power because of the difficulties in defining it and because of its prevalence almost in every social phenomenon. Yet, Barnes believes power can and should be researched. Following Barnes' advice the strategy we applied in our research was twofold. On the one hand, we drew on a theory of power that includes insights from different sociologists and political scientists and, on the other hand, we adopted an interpretive approach for our research. The interpretive approach allowed us to elicit the organisational members' interpretations of the different structures of power and authority. We did this because our belief that a researcher studying power relations should look at the contrast between what an official organisational chart says and the way employees interpret it. This difference between the formal and the interpretation of the formal highlights the relevance of an interpretive approach to the study of power relations. Thus, our understanding of the power relations in CEFORMA would have been very different if we had only sent questionnaires to a selected group of staff members.

We were able to conduct two types of case studies. One was based on secondary sources while the other was based on the original data sources. The first case study showed the feasibility to conduct case studies particularly when access to the original source is difficult to obtain and there are documents and other sources that have reported on the case. By contrast the second case study suggested how important it is to develop a rapport with the interviewees in order to obtain an in-depth grasp of the politics of the organisation. The selection of the case study as our research method, then, was fundamental in obtaining an in-depth appreciation of the power structures and relations in the organisations under study, particularly at CEFORMA.

Besides interviews, the analysis of our major case study benefited from having access to documents and consultants' reports. Particularly useful were the proposals, plans and reports regarding the OIS. They facilitated our understanding of such a

broad project. Likewise, the minutes of the steering committee were also useful, especially in observing its members' trend of not attending the meetings. Furthermore, the organisational climate study was key for analysing of the circuits of social and system integration. This document was utilised to put in context the answers of our interviewees. Another crucial tactic was to interview personnel who were made redundant, since they were outside the power scope of the organisation. However, we had to be cautious since the dismissal from the organisation could have generated some well-understood bitterness. E-mail was also helpful, especially for following up the progress of our sub-units of analysis. Theoretical and methodological contributions are also linked to practical contributions. That is the theme of the following sub-section.

7.2.3 Practical Contributions

The practical contributions of this dissertation stem from both the theory and the findings of our case studies. In studying power, practitioners could use the circuits framework to analyse power relations in organisations. By focusing on the circuits of social and system integration we learn how an information system is going to affect rules of meaning and membership, job tasks, supervision and control techniques. Likewise the episodic circuit emphasises the power required or exercised by certain agents to accomplish the adoption and institutionalisation of information systems. In this sub-section, firstly, we describe the practical contributions derived from the circuits framework and, secondly, we focus on the contributions drawn from the findings of the case studies.

Let us now concentrate on the practical contributions of considering the circuit of system integration. We know that managers and developers of information systems should pay attention to how the information systems they manage or develop match the productive activities of organisations. This is observed by (Avison and Fitzgerald 1995; Avison and Wood-Harper 1990; Suchman 1995) who emphasise the relevance in understanding how work is represented in developing and designing information systems. This underlines the relevance of user requirements eliciting techniques. Thus, on the one hand the system integration of an information system depends on how well the task the system is either supporting or automating can be specified. Yet,

on the other hand system integration also calls the attention of developers and managers of information systems by highlighting the disciplinary techniques they need to deploy in developing the system and how those techniques may affect the other circuits. Combining techniques of production with techniques of discipline is the essence of system integration. System analysts and managers may have known this beforehand, but the contribution of our research is to understand -based on a theory of power- why system integration on its own does not guarantee the adoption and institutionalisation of an information system.

The study of the circuit of social integration, i.e. the study of dispositional power, leads us to consider the formal and informal structures of authority, and the rules of meaning and membership of organisations. We believe that considering these is not only relevant for researchers of information systems but also for managers, developers and users. The lack of social integration of an information system may indicate why a particular agent cannot be enrolled into the system. Managers and developers need to know whether they will be able to enrol and mobilise agencies to make the information system adopted. Emphasis on social integration is one of the strengths of participative information systems development methodologies, and its disregard a weakness of formal methods. Users can also benefit from understanding social integration especially if they want to take an active role in the development and adoption of information systems. By knowing their dispositional power and that of the other organisational members, users can make their actions more effective.

The four steps of translation of the episodic circuit point to different skills that managers, analysts and users of information systems may develop to enhance their interaction with the systems. The relevance of the problematization and interessment steps stress how crucial it is for managers and developers of information systems to develop verbal and symbolic skills to convince and persuade other agencies, especially when they lack dispositional or facilitative power. Since the third step of translation, enrolment, depends on negotiations managers and developers of information systems with political and negotiation skills may increase the likelihood of enrolling other agencies. Furthermore, if managers and system developers want to enrol other agencies, then they need to know how to translate and represent the interests of these other agencies and how to counter competitors.

The mobilisation step calls the attention of managers and users of information systems because it is important for them to know who are the spokespersons or representatives integrating the agency network. Once they have identified the network they know who are the agencies that make the system stable. Thus, threats to the network are threats to the stability of the system. This was the case of the statistical computing unit that was almost wiped out of the organisation because of exogenous contingencies. Probably, managers, users or developers cannot do anything against exogenous contingencies, since these lay beyond their scope of action, but they may formulate contingency plans. Conversely, if managers want to get rid of the system, then the knowledge of the relationship between spokespersons and agencies is fundamental. This is because the stability of the system depends on the stability of those relationships. Likewise, users also can use this knowledge, i.e. the composition of the network, to resist when according to them the information system is to be opposed. They may undermine the stability of the network of agencies by bringing about a split between spokespersons and agencies.

The circuits framework also highlights the relationship between resources and the institutionalisation and adoption of information systems. If a system is posed as an obligatory passage point for the acquisition of crucial resources, this system is very likely to become institutionalised as was the case with the administrative information system. Knowing this may help organisations in making their information systems adopted and institutionalised. However, if the systems are poorly designed the results can disturb social and system integration. In the administrative case we saw how the new information systems empowered the control officers who exercised discretion over administrative requests. This caused administrative requests to be processed slowly and most of the times arbitrarily. Thus managers can benefit from knowing this also, either by deciding when to institutionalise a functional system or to remove one that is dysfunctional.

The case of CEFORMA's organisational information system allowed us to learn about the politics of steering committees. We learnt a technique for analysing them and a practical principle. Sociology of translation may be useful for the analysis of the power relations of steering committees, especially when the latter are deemed to be a network of allied agencies. Someone interested in the politics of a steering

committee may draw the network of agencies composing the group along with their respective translations as was shown in Chapter Six. The sociology of translation might therefore help organisational members to assess the strength and power of committees and groups involved with the information system. Furthermore, we also learnt from our analysis of the OIS steering committee that the facilitative and dispositional powers of the committee members are relevant in understanding the course of action of the committee. For example, the gradual desertion of the committee members started when the director stopped attending the meetings. In other words, when the members of steering committees have more dispositional and facilitative power than the chairperson, then the control and leadership roles of the committee's co-ordinator are undermined.

The circuits framework, particularly the sociology of translation, may be useful for those using participatory techniques for developing and designing information systems. Analysts may use the framework to trace the political links between representatives and groups represented. This will allow analysts and managers of information systems to assess the political feasibility of their efforts. Moreover, the application of the circuits of power framework for understanding the political context of the information system might shed light on how to create and strengthen the alliances required to facilitate the adoption and institutionalisation of the systems. Analysts and managers lacking power may attempt to follow the four steps of translation to consolidate the alliances and political support required for developing the system. Conversely, for those users who want to understand and subsequently influence the development and use of information systems, the circuits framework can be used as an instrument to understand the political and power factors affecting the system. This knowledge might be a starting point for emancipation despite the paradox discussed in Chapter One.

To sum up, the study of the power and politics in adopting information systems is relevant not only for researchers but also for managers, users and system designers. Researchers will find that studying political and power issues widens their understanding of the relationship between information systems and organisations. Managers will find it relevant as two of their main tasks are to marshal and to integrate resources. The circuits framework and the findings of the case studies can

also be used as a guideline to depict power relations and therefore it can be an instrument to estimate the political feasibility of adopting and institutionalising information systems. Users will find the research relevant as its findings can shed light on the forces that lead them to adopt an information system. Hence whenever they perceive their interests are being threatened, users either may pose an effective and legitimate resistance, or decide not to resist when the power they are facing seems insurmountable. Designers and system analysts can also benefit from this research as they can use the circuits framework to analyse the political base of those groups involved in their work. Systems analysts may realise that without political and power support their attempts to design and develop useful information systems could be ineffective. Although they may know this already, the circuits framework may help them to understand and make sense of a complex and often hidden phenomenon such as power.

7.3 Implications of our research approach

7.3.1 Research design limitations

The main contribution of the dissertation is in having adapted the circuits of power framework to study the power and politics of information systems in organisations. We showed how it can shed light on the politics and power that make information systems stable. The findings of our case studies do not allow us to induce a new theory on those types of organisations. The purpose of each case study was to show how the adoption and institutionalisation of information systems can be understood from a political and power perspective. However, the dissertation is limited in generalising the findings to other organisations. What we have done is to generalise in form of principles some of the findings, yet we would not claim that those principles are universal or form new theory.

We have already discussed the implications of our research by selecting an interpretive approach and the case study as a research technique we gained in depth, but we cannot claim generalisations to populations of organisations. Nevertheless, we may have contributed to research methodologies by proposing a set of research techniques, an interpretive one, for how to do research on power and politics. By

examining documents, interviewing people, attending meetings and visiting the site, we were able to see the contrast between formal authority and its interpretation. That dimension we believe would have been very difficult to capture by using a survey, for example. Yet the main issue for a researcher to reproduce this type of investigation would not be the use of research techniques but to obtain access to an organisation in such a way that their members would be willing to share their views on the power relations and politics of their workplace and to share documents. In this situation the researcher may apply the steps of translation to interest and enrol the organisation. However, for a research of this type obtaining access to an organisation, is in effect an issue.

Finally, there is the issue of the researcher's bias. In interpretive research there is always the criticism of the bias of the researcher. In the context of our research it is possible to believe that because the researcher worked in CEFORMA before he might be biased. We attempted to counter this argument by presenting a variety of data from different sources. Nevertheless we should emphasise that the fact that the researcher had previously worked in CEFORMA helped him in gaining access to documents and developing rapport with the interviewees who were willing to talk about the politics of the organisation. Thus the risk of bias was compensated by the benefits of obtaining access to the organisation, its members and documents.

7.3.2 Adequacy of the research framework

We could have selected other theoretical frameworks but we chose Clegg's work because of his thorough analysis and insightful critique of previous frameworks of power. Furthermore, his framework offered a detailed and integrated view of power that other frameworks lacked. However, the problem with his framework was the fact that he did not make any link between data and his theory. The only example he provides on how to apply the framework is his interpretation of the birth of the modern nation state in Europe. Besides the lack of indication of how to link data and theory and the epistemological issues pointed out by Collins and Yearly (see Chapter Three), we found in the circuits framework three main issues that could generate genuine criticism: (1) its emphasis on the institutional dimension of information systems and its disregard of decision making processes; (2) its emphasis on

contextual factors rather than on processes; (3) its disregard of ethical aspects of power.

On the first issue we could answer that the emphasis on the institutional dimension of organisations is precisely why we decided to use the framework. Although we acknowledge that the circuits framework is far from rational choice and decision making theories, we believe that the decisions made by agents are influenced by their institutional environment; that is what we focused on our case studies. This was observed by March and Simon (1958) when they suggest that decisions are influenced by institutions, i.e. by value assumptions, cognitive frames, values and routines. In short, they claim that a rational individual is an organised and institutionalised individual.

The second issue may be conceded if the framework had only included the system and social integration circuits. However, the circuit of episodic power, by incorporating the sociology of translation, considers events that are relevant for the research. The sociology of translation allows the researcher, once the agents have been identified, to follow them throughout all their actions and attempts to fix obligatory passage points. It is in the identification of agents that the researcher has to interpret the organisation, hence the importance of building the organisational context as the outcome of depicting the circuits of social and system integration. Moreover, the consideration of these two circuits plus exogenous contingencies makes the circuits framework a useful instrument for linking process with context.

Walsham (1997) notes that the sociology of translation or actor-network theory disregards social structures. He cites Habers (1995) and Reed (1995). Reed particularly criticises actor-network theory for not considering institutional issues when studying how it is that actions are executed. In this research by concentrating precisely on the institutional aspects, we believe the circuits framework responds to that criticism. Walsham suggests that to overcome this limitation actor-network theory should be applied along with another theory such as Giddens' theory of structuration. In this dissertation we drew on actor-network theory in the context of Clegg's circuits of power. Although pure actor-network theoreticians may disagree with this move, we believe that orthodoxy may be left aside to allow understanding

and clarity to come in: at least that was what we did in this dissertation to make more sense of power relations.

The main criticism of amorality and lack of a political approach of sociology of translation comes from Winner (1993). He claims that social constructivist studies of technology do not take into account political and moral aspects. This is because of the agnosticism principle of the sociology of translation that states that the researcher should be constrained in making any value judgement during the description of the translation. However, by putting their analyses in a political context, our case studies have pointed out political disparities and probably moral dilemmas. For example, in the case of the LAS our analysis questions the criteria that opting for the cheapest bid is always the most sensible way to make decisions regarding public money and indicates doubts on those enthusiasts that believe that information systems can automate any job task.

In the case of CEFORMA by linking the political elements that contributed to the fixing of the statistical computing unit, we pointed out the interests and manoeuvres of the donor countries, as well as the complete disregard of the populations involved in the positivistic studies. That, we may suggest, indicates an issue with strong ethical connotations. The study also was useful to point out how, when the Central American countries adopted democratic governments, the gap between the power of the donors and researcher *vis-à-vis* that of the population was narrowed. Thus we believe that by putting the sociology of translation in the circuits framework the former gains a moral and political perspective while the latter obtains a strong descriptive tool that involves the interplay between social and technological agents. However, the ethical issues involved in the application of a framework such as the one introduced in this dissertation have to be addressed.

Actor-network theoreticians have responded to the amoral critique by saying that their theory aims at constructing the network of alliances (Latour 1986). Thus, researchers should focus on constructing the network and then they should think about the ethical matters. However, this does not answer Winner's critique in the sense that actor-network followers should acknowledge the ethical issues involved in their application of the theory, particularly the ethical values that concern the selection of their topics, actors and interpretations. In this dissertation we have to

acknowledge the values that influenced our selection of the cases and may have been involved in their interpretation. Indeed, this dissertation has been influenced by the values of its author, i.e. an aversion for autocratic organisations and dictatorial governments. Yet, not only the use of the framework introduced in this thesis by researchers entails an ethical consideration but also the purposes with which practitioners, i.e. managers and information systems professionals, are going to use the framework.

Contrary to a particular information systems development methodology such as ETHICS that states clearly that job satisfaction for workers should be paramount and contrary to a theory for interpreting such as critical theory that considers emancipation as the ultimate goal of generating knowledge. The circuits framework does not have intrinsically any of those values. In fact, the framework stems from a Machiavellian tradition that aims at interpreting power without making any *a priori* value judgement regarding those actors involved in power relations. Hence the risks of using it without responsibility since it could be used to satisfy personal or immoral interests. The author of this dissertation holds humanistic values, therefore he can only expect and hope that practitioners would use the framework with moral responsibility.

However ethically responsible practitioners may be, they should also be aware of the danger in applying the circuits framework as a template. The richness and value of the framework do not lie in literally building the circuits of power. Its value derives from understanding the concepts and ideas that underpin the circuits of power and the relationships amongst them. It is only after understanding and becoming familiar with those concepts, that the framework may be used to interpret and understand the power relations between organisations and information systems. Otherwise the framework will be a misleading and even dangerous instrument. Thus, researchers and practitioners should be aware of the ethical values involved in the application of the framework and should be careful of not using it in a mechanistic way without understanding the concepts and ethical issues involved.

We also acknowledge the limitations of our theoretical framework in accounting for agents' decision making processes. There is not much we could do about it since our focus was the institutional dimension of organisations and

information systems. We believe, though, that understanding the institutional side of information systems is a step towards understanding processes of decision making. Regarding the criticism of actor-network theory and sociology of translation, we would like to stress that by putting them in the context of the circuits of power we were able to overcome some of the criticisms, in particular, those that indicate its lack of political perspective and its disregard of social structural considerations.

7.4 Areas of further research

The circuits framework was applied to understand and make sense of the processes of adoption and institutionalisation of information systems. We believe the field of information systems would benefit if the framework were to be applied to other areas such as methodologies for analysis and design of information systems. This could be done on two levels. One is by assessing how it is that current methodologies account for power and politics. This way we could know how system developing methodologies can be enhanced particularly when those methodologies overlook the political and power dimensions of information systems. The other level would be to research how elements of the circuits framework can be adapted so they may become part of the techniques of the methodologies, especially for analysing the political and power elements of information systems.

To enrich existing methodologies for analysis and design of information systems, the circuits framework would need to improve its data representation techniques. We acknowledge that our case studies illustrate how to analyse the institutionalisation and adoption of information systems, but those cases cannot indicate how to use the concepts of the framework in analysing and designing information systems. Thus an interesting area of research would be to apply and develop further the framework in case studies where the main topic is analysis and design of information systems. The development of data representation techniques for the circuits of power would help practitioners, users and managers in analysing the political and power factors that affect and are affected by information systems. Once representation techniques have been devised, these can be integrated to information systems development methodologies.

Increasingly organisations are opting for not developing their information systems in-house but to outsource those services. The relationship between outsourcing firms and organisations who hire their services is loaded with power and control issues. We believe an interesting area of further research would be to apply the circuits framework to study these relationships. It may not be worth applying the whole framework but only one of the circuits. It would be interesting, for example, to apply the sociology of translation to understand how it is that outsourcing firms exercise power over organisations and vice versa. The value in research like this could be for managers of both types of organisations, those providing and those receiving the services. By applying the framework to outsourcing, organisations can benefit by assessing the power relations that link them with the outsourcing company. Organisations receiving outsourced services, for instance, may establish how dependent they are on the outsourcing firm, and moreover they may identify the agents on which the stability of the relationship depends.

This research was mainly deductive because it took as a starting point a theory, then it visited a case, and finally it came back to the theory to suggest how to apply it in the field of information systems. However, the circuits framework may also be used in inductive research. This would involve large samples of organisations. The outcome of the study may categorise and classify different types of organisations. This type of inductive research may help governments to draw national or sector policies. For example, governments with authoritarian traditions might analyse whether to emphasise or not social integration as a fundamental factor in developing and designing information systems; this could guide them to select appropriate methodologies.

Our work does not pretend to be the final word in power, politics and information systems. On the contrary, by recognising the insights and contributions of previous research we want to emphasise the relevance of conducting cumulative research. If there is any ambition in this thesis it would be to assist other researchers in their task of developing intellectual tools for the study of power and information systems. We conclude that the circuits of power framework can be used to understand the power relations involved in the adoption and institutionalisation of information systems. We do not claim it is the only framework that could do that, or want to

reduce all phenomena to be understood as a power issue. But, we have certainly shown that by encompassing three different types of power, dispositional (‘power storage’), facilitative (‘power to’) and episodic (‘power over’), we were able to describe how a network of agents kept the system stable and institutionalised and how when the network of agents was not strong enough, or yielded to exogenous contingencies, the system became unstable. We also believe that the circuits framework needs to be developed further, especially in the representation of data techniques, if it is to be used as a tool for developing information systems. Finally we hope this work will be a real contribution towards understanding how information systems interact with organisations.

Appendices

Appendix One

Interviews and data collection guide

The collection of data for this research has been guided by the six main elements of the framework described above (outcomes, exogenous contingencies that introduce change in the organisation, episodic circuit, social integration circuit, system integration circuit and obligatory passage points).

General Topic Guide

This guide was developed from our understanding of the circuits framework.

- Research the history of the organisation. Focus particularly on the way they usually have adopted innovations such as information systems.
- Interview people from different levels. This is fundamental, if there is no access to senior management and employees the analysis will lack depth. It would be relevant for the study if once can interview people that no longer work in the organisation as they are outside the scope of action of powerful organisational agents.
- Do not tape the interviews. People might hold back if they know they are being recorded, especially if the conversation centres on the politics of the organisation.
- To allow the interviewees expand their views use semi-structured type of interviews. Ask them to tell a story regarding the information system. Ask for example: Would you tell me the how this information system was developed or implemented? Emphasise those issues regarding power and information systems. At the end ask the interviewee for a theorisation about the facts. This is very

important because in this part the interviewees tell their own interpretation of the story.

- Analysing documents is also relevant. Particularly those regarding the information systems, such as announcements or training documents. It is also important to identify who attended launching or introductory meetings and to inquire about the reactions of the participants.
- It is important to have a facilitator or sponsor within the organisation who understands and get along well with the researcher, so he or she can help in identifying interviewees or documents.
- It will be relevant if the researcher can participate as an observer in meetings regarding the information system. This allows the researcher to grasp the informal dimension of the site.
- It is important for the researcher to show a neutral position, particularly in conflict situations. Interviewees should not perceive that the researcher is collecting information to favour any of the parties in conflict.

The following sections introduce specific topics for each of the elements of the circuits framework.

Interviews and data collection guide for *exogenous contingencies*

To identify these, the researcher should look at what is the dominant ideology in the context surrounding the organisation. The researcher should identify in these context elements affecting the organisation such as: legislation, government policies, technological trends. Also it is important to have a look at the position that the organisation has in relation to other similar organisations. For example, the researcher should establish whether the organisation is the leader in its field or not.

- Look at the history of the organisation and its mission.
- Identify what is the position of the organisation within its context (e.g. Is the organisation amongst the leaders).
- How has the organisation adapted to previous information systems or innovations?

- Describe how was the institutionalisation carried out.
- Was the institutionalisation the result of coercive forces, such as legislation or regulations?
- Was the institutionalisation the result of mimetic forces. Was the information system adopted as a reaction to uncertainty or imitation because it was successful in other existing organisations.
- What variation in the environment of the organisation did bring about the introduction of the information system?
- What changes in the environment of the organisation did favour or impede the introduction of the information system?

Interviews and data collection guide for *the circuit of social integration*

The identification of this circuit is concerned with the norms, rules of meaning and membership that prevail in groups within the organisation. These norms and rules allow the existence of agents' networks that are created through the process of sociological translation. To identify this circuit the researcher should ask questions such as: What is the relationship between the information system and groups (in terms of their participation to sustain or to disrupt the information system)? What are the norms that define those groups? What are the membership rules? It also will be important to establish how these rules and norms are adopted and sustained. In doing so, the researcher should look at the relationship between this circuit and the environmental contingencies. This will allow the researcher to determine the stability of the norms and the potential influence of the environment over the social integration circuit. Issues to focus on:

- Obtain the formal and informal structure of the organisation.
- Identify possible points of strain between the information system and the institutional order within the organisation. Look for change in meanings, if there is contradiction then tension will be unavoidable.
- If the new norms and meanings arose from the new system want to be sustained they might threaten the established order. This is important to be considered

because it shows that the introduction of information systems if successful can transform the current order.

- Has there been any recent change in the group norms or meanings? What was the cause of this change?
- How was the adoption of the information system interpreted? Who set the interpretation rules?

Interviews and data collection guide for *the circuit of system integration*

The researcher should identify here the technological and material conditions prevailing in the organisation. This will imply establishing what are the techniques and knowledge required to produce the outcomes and the mechanisms of control and discipline exerted over the physical and social context of the organisation. The researcher should ask questions such as:

- How are the members (groups and individuals) of the organisation achieving their goals?
- What are the material resources, techniques and skills that organisational members require to perform their tasks?
- What are the mechanisms of control and discipline exerted over the organisational members when they perform their activities?
- Why particular innovations were adopted?
- Who are the organisations or institutions that are influencing the adoption of the new technology?
- Who are benefited? Answering these questions will allow the researcher to identify how the environment influences organisations. Thus, the researcher could anticipate what changes in the environment might have an impact in the system integration circuit and therefore in the organisation.
- Describe the role of the information system in the exercise of power (control or surveillance or as an automation tool, i.e. technology for increasing production).

- What other resources were deployed along with the information system to achieve the outcome?: Threats, discourses (words), training, money, and other means of control, new rules (either explicit or implicit).
- Are all agents in the organisation subject to the same regime of discipline and control? Resistance might arise from those not subject to the same regime.

Interviews and data collection guide for the episodic circuit of power and obligatory passage points

To identify the circuit of episodic power the researcher should concentrate on the struggles to establish or maintain control over resources. Once the information system under study have been identified, the researcher should answer questions such as: What are the outcomes people intend by executing actions? Who are performing those actions? Which resources they need? Which alliances allow control over resources? Who are resisting them? Issues to focus on:

- Identify power actors (the best way of doing this at the beginning is asking interviewees who do they consider to be powerful)
- How did other agents react? Did they oppose resistance? Describe the resistance presented by other agents.
- How was the resistance outflanked, circumvented or counterpoised?
- How did the resistance result triumphant?
- Ask other agents how did they interpret the objectives of the information systems?
- Identify which groups want to exert power over others, who would oppose resistance to keep control over their resources and those who are being disempowered or empowered by the introduction of the information system. Those losing discretionality will resist and those with more discretionality will perceive that they have been empowered.

- It is important also to identify those who will be subjects of control by the introduction of the information system. Those perceiving themselves as the subject of control might resist.
- Did agents succeed in controlling resources and achieving their outcomes? Describe how they achieve this control? How did agents defeat (outflank) resistance?
- Did subordinates have any chance to resist. Did they know how to resist? Did they have resources to offer resistance?
- What other agents came into play because of the introduction of the information system?
- What new alliances were required for the institutionalisation of the information system?
- What was the result of the information system? Did those proposing it achieve their intended outcomes?
- Ask managers about their intentions in introducing the information system.
- Ask managers whether they consider they have achieved their intended outcomes?
- Identify what are the resources (material and symbolic) required by agents to achieve their desired outcomes.

An obligatory passage point is a rhetorical device that presents the solution for a problem in terms of the resources of the agent that is proposing it. A successful OPP must convince all agents that the only way to solve the problem is by traversing the OPP. To identify OPPs the researcher might pay attention to the language used by agents particularly their discourses and statements aimed to define activities, to obtain support from other agents and to create alliances. This thesis assumes that information systems are OPPs. List of issues and questions:

- Look at how the information system was introduced, particularly the explanations, negotiations or manoeuvres that accompanied the adoption and institutionalisation of the innovation.
- Were other agents convinced with explanations, or forced by agents owning the information system?
- How the explanations for the information system and its rationale for adoption were presented?
- By drawing on the sociology of translation identify and describe how the information system was institutionalised.
- In which terms agents translated the information system?

Appendix Two

LIST OF INTERVIEWEES

Name	Position
Mrs. Claudia Mancilla	Technical co-operation assistant
Mrs. Francisca Gonzalez	Former country representative
Dr. Lorena Morales	Former education research project manager
Dr. Simon Koch	Education and pabulum research project manager
Mrs. Katerina Montes	Anthropologist
Mr. Jacobo Morales	Analyst-programmer, scientific-technical information system
Dr. Juan Carlos Porras	Education and pabulum researcher
Mr.Ramiro Blanco	Librarian
Dr. Juan Castro	Director
Mr. Pedro García	Senior analyst-programmer, scientific-technical information system
Mr. Luis Martínez	Analyst-programmer, scientific-technical information system
Dr. Elías Gaitán	Operational and applied research officer
Mr. Gonzalo Valladares	Chemical engineer
Ms. Graciela Aparecido	Secretary
Mrs. Margarita Fuentes	Former scientific-technical IS co-ordinator, currently PR officer
Ms. Miriam Molina	Pabulumist
Mr. Cristobal Ramírez	Administrative information systems co-ordinator
Ms. Mariela López	Head of the finance department
Dr. Vera Jones	Education and pabulum research project manager
Mrs. Barbara Valmaceda	Head of the Administration Department
Mr. Gaspar Rodríguez	Former administrative officer
Mrs. Wendy Ladino	Biochemistry researcher
Mr. Wilbur Mercado	Personnel and staffing co-ordinator
Mrs. Joana Guzmán	Data entry clerk
Mr. Germán Valdez	Analyst-programmer, administrative information system
Mr. Jorge Mario Monterroso	Former analyst-programmer, administrative information system
Dr. Napoleón Complejo	Co-ordinator Scientific & Technical Area and scientific-tech IS
Dr. Juan Sisayón	Statistician & researcher
Ms. Azucena Valdivia	Administration of research projects
Mrs. Perla Bocanegra	Anthropologist
Mrs. Lidia Loaiza	Data entry clerk
Ms. María Dellucci	Secretary

Mr. Egar Vivar	Administration officer, responsible of goods and services department
Dr. Daniel Santos	Former co-ordinator of the Technical Co-operation Unit
Mrs. Isela Vega	Co-ordinator food system unit

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