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LIST OF ABBREVIATIONS

ICT   Information and Communication Technology

GDSS   Group Decision Support System

PMI   Project Management Institute

CCTA   Central Computer and Telecommunications Agency/Office of Government Commerce

PRINCE2   Projects in Controlled Environments II

TIP   Time, Interaction and Performance

UAV   Unmanned aerial vehicle

CE   Concurrent Enterprising

ACKNOWLEDGEMENT

1. INTRODUCTION

"Coming together is a beginning,

Keeping together is progress,

Working together is success"

- Henry Ford -

1.1. MOTIVATION AND OBJECTIVE

The aim of this study is to contribute to our understanding of routinisation in a network organisation. Routinisation is a process (Pentland & Rueter, 1994) in which people interact and learn in order to achieve common patterns of behaviours or standardise procedures.

A network is an organisation that brings together different firms that have different working structures and cultures, but that collaborate to achieve commonly shared strategic business objectives. Typical examples of network organisations would be the Airbus A-380 programme consortium or Star-Alliance of Lufthansa with other airlines. In network organisations, project-oriented collaborations have replaced internal schedules, standard operating procedures (routines) and hierarchical control of firms. Nevertheless projects only exist for a limited period of time, while network social structures are constantly changing between projects (Katzy, Evaristo, & Zigurs, 2000), especially when new people with different culture backgrounds join or leave. Therefore network projects often encounter collaboration barriers such as lack of stable social and reference working structures, which increase the risk of projects and network organisations failing (Grabowski & Roberts, 1999; Miles & Snow, 1992).

Routines are important structures for effective collective actions in firms as well as network organisations (March & Simon, 1958; Stinchcombe, 1990). Earlier understandings of routines are fixed rules or standard operating procedures (Cyert & March, 1963; March et al., 1958; Nelson et al., 1981; Taylor, 1947) that reflect the past memory of know-how. These rules or standard procedures regulate people's interactions at work in a stable environment. These routines are seldom changed, unless there is a major crisis, or during a firm's start-up phase. Recently author likes (Cohen & Bacdayan, 1994) have argued that existing theoretical understandings of routines need to be furthered for better understanding on where routines come from or how they change (process of routinisation). In network organisations social and organisational structures are not as stable as within a firm, but are constantly changing and evolving. Therefore a new theoretical development on routinisation will help to uncover why certain network organisations do operate effectively after a certain period of time while still facing ongoing social and organisational structure changes.

Contemporary routinisation-related theory development can be based on three different levels of analysis: team interaction, firm operation and firm strategy. On a team level, routinisation is generally understood as team interaction and evolution processes that result in repeated patterns of behaviour. Recently, there are also increasing discussions about the importance of understanding routinisation of team interactions. (Wood & Gray, 1991) argue that a lack of commonly shared routines (interactive process, rules, norms, and organising structures) is a barrier for enabling productive interactions for teams. (Massey, Montoya-Weiss, & Hung, 2002) have also claimed, in their paper on global virtual teams, that: "*successful team outcomes depend largely on the nature of a team's interaction processes: i.e. the intertwining threads of activities that evolve simultaneously and interlock in different patterns over time.*" Similarly from the

perspective of team dynamic and organisational learning theories (Dixon, 1993), authors like (Kloppenborg & Petrick, 1999) have addressed the importance of enabling routinisation in order to overcome the different defensive routines of the team members.

Despite this increasing attention to team routinisation, there is still a lack of any unique team concepts or theories to capture the full dynamics of routinisation in teams, especially for network project teams (Bishop, 1999; Bubshait & Farooq, 1999; Carmel, 1999; Massey et al., 2002; Morris, 1988; Thamhain & Wilemon, 1987). For example, the linear team dynamic sequential model: Forming-Storming-Norming-Performing (Hare, 1976; LaCoursiere, 1980; McGrath, 1986; Tuckman & Jensen, 1977) is one of the earlier team development concepts. This concept addresses social configuration stages which teams have to go through before being able to harmonize their patterns of behaviour and interact effectively (Zigurs, Evaristo, & Katzy, 2001). Nevertheless, there are several limitations on this conceptual model. Lack of clear explanation as to what mechanisms are needed to manage changes between the four different stages (Gersick, 1988), and multi-interactive sequences instead of a linear single sequence (Fisher, 1970; Poole, 1983) have been pointed out as the main weakness of this existing sequential model. Apart from the linear model, other conceptual approaches, such as studying team communication and coordination patterns, have also been used extensively by the team researchers (Belanger, 1999; Burn & Barnett, 1999; Bush & Frohman, 1991; Christensen, 1999; Iles & Hayers, 1997; Massey et al., 2002; Ramesh, 2002; Scott & Timmerman, 1999; Suchan & Hayzak, 2001; Tan, Wei, Huang, & Ng, 2000; Thompson & Feldman, 1998; Watson Fritz, Narasimhan, & Rhee, 1998; Zigurs et al., 2001). But the findings didn't provide further insights on routinisation of team interactions, and suggested some coordination mechanisms to facilitate interaction for certain instances occuring at specific point in time. In the (McGrath, 1991) paper on time, interaction,

and performance (TIP) theory of distributed teams, he argues that team interactions don't always follow same stable patterns, but evolve with different temporal patterns of behaviour which need to be regulated. "*A significant problem facing dispersed teams is coordinating the temporal patterns of team behaviour.*" (McGrath, 1991)

From firm operation perspective, routinisation has received little attention from earlier researchers whom studied routines only as reflection of post-hoc memories of a firm (Cohen et al., 1994). It is only recently that several authors (Feldman & Pentland, 2003; Pentland et al., 1994) have reported that routines not only exist as long-lasting standard work procedures, but could be sets of common patterns of actions which are constantly subjected to change due to new ideas or improvements made by the stakeholders. In the (Becker, Lazaric, Nelson, & Winter, 2005) paper, these authors also claimed that organisational change in firms is strongly linked with changes of routines, because routines directly reflect managers' change in decisions and change of different stakeholders' behaviours. Based on this new change perspective of routines, several authors (Cohen et al., 1994; Feldman, 2000) have called for new theory development to better understand actual process of routinisation. In Feldman's study on school accommodation office hiring routines (Feldman, 2000), it was suggested that the process of routinisation consists of four iterative stages: ideals, plans, actions and outcomes. Based on this stage model, routinisation is very much driven by people's ongoing learning and improvement in order to achieve better performance. This new change perspective of routinisation provides the basic conceptual ground to understand how routinisation could take place in networks, in which ongoing changes are the basic operation principle (Katzy, 1998). Nevertheless, many of these theoretical discussions on routinisation are still based on one single firm with a stable social structure of people working in the same location with a commonly shared culture. Therefore these concepts

cannot be directly applied to understand routinisation in network organisations without further empirical studies on the subject.

From the perspective of firm strategy, routinisation is a learning capability that enables firms to change and hence react to dynamic market environment (Eisenhardt & Martin, 2000). Unlike stable operational procedure type of routines, the capability view of routines is seeks to bring about desirable changes in the existing set of operations in firms (Zollo & Winter, 2002). In this way, these routines not only preserve the past, but changes with the ongoing learning through experience accumulation, knowledge articulation and codification (Zollo et al., 2002) within the firm, thereby shaping the future development of the firm (Becker et al., 2005). As (Becker et al., 2005) point out, routines are made up of both people's explicit and tacit knowledge, and the tacit knowledge is susceptible to influence by its bearer when it is applied and replicated. Therefore how different partner firms within networks engage to exchange and share tacit knowledge will certainly influence effectiveness for productive routinisation in network organisations. Nevertheless analysing tacit knowledge, by its bearer in network organisations, when studying routinisation is still not often addressed by researchers. Therefore, new approaches and further explorative studies are required.

Routinisation in network organisations has never been the major focus of today's organisational research. When compared to firms, network organisations often don't have any common organisational structure, which is the prerequisite to ensure effective working in firms. Therefore projects are the only organisational structures for working in, and changes to, networks (Katzy et al., 2000; Katzy & Horodyskiy, 2002; Katzy, 1998). Knowledge exchange and accumulation between different firms in network organisations is also occurring in projects (Zigurs et al., 2001). Hence analysis of

multi-projects across a certain time span will be the first step in revealing how routinisation could take place in network organisations.

Although there are already some standard project management (PM) routines proposed by the Project Management Institute (PMI, 2004) and PRINCE II to facilitate project works in firms. But these routines are developed based on a single firm which is structurally stable and managed by project managers who have the definite authority for a single point of responsibility (Bechtel, 1989; Crawford, 2000b; Stretton, 1994). Most of these conditions cannot be directly applied to network projects, because network projects often start without a common organisational or social structure between the participating firms, and actual organisational or social structuring and restructuring of network organisations occurrs while the network projects are being carried out. Hence study of possible routinisation taking place across network projects is also critical for the understanding of network organisational structures. Nevertheless, there is still lack of unique theory for studying routinisation in network organisations. Therefore this study has taken a grounded theory approach (Eisenhardt, 1989) to explore longitudinal collaborations in projects in three different engineering networks, and also to try to identify mechanisms which enable routinisation in network organisations. In addition, (Giddens 1984)'s social structuration framework will also be adopted as the initial guiding theory, because the structuration framework provides a dynamic explanation of the duality relationship between actors (network firms) and network organisational structures (sets of routines). The duality relationship between actors and routines explains why changes in actors' interactions also lead to changes in overall structure. *"Routine is integral both to the continuity of the personality of the agent, as he or she moves along the paths of daily activities, and to the institutions of society."(Giddens, 1984)*

This is directly inline with (Cohen et al., 1994)'s suggestion to study interactions between different stakeholders in order to identify possible routine behaviours that structure the actions of different stakeholders.

This thesis is also an extension of a dedicated research programme at the Centre for Technology and Innovation Management (CeTIM) at Leiden University and University BW Munich, which focuses on the concept of dynamic capabilities. Previous works including measurement of dynamic capabilities under conditions of high uncertainty in new technology-based ventures (Dissel, 2003), dynamic capabilities of product development (Blum, 2004), and dynamic capability and growth of technology-based new ventures (Strehle, 2006). The outcome of this thesis is to further the understanding of dynamic capability in the context of rotunisations in network organisations.

1.2. RESEARCH QUESTION

This thesis addresses the following research questions:

- How does routinisation occur in networks?

- What are the driving mechanisms to enable routinisation in networks?

1.3. EXPECTED RESULTS AND CONTRIBUTIONS

The main academic contribution of this thesis is to address existing limited understanding and empirical study of routinisation in network organisations. Although there is already some routinisation-related research on different levels of analysis, most of these studies are either in their early phase of research or focus only on routinisation in a single firm. Research on this topic requires a long period of observation or rich past archive data, and thus the expectations are not to provide a generalisable result, but to initiate and explore this potential new research direction.

Another academic contribution of this study is to extend existing theoretical development on routines. Routine traditionally has been considered as fixed rules or procedures (Ashforth & Fried, 1988; Weiss & Ilgen, 1985) which evolved through past learning experiences within a single firm. Nevertheless, in network projects, different firms with different working cultures are often involved and the network membership is constantly changing. Therefore this study aims to explore how routinisation could take place in network organisations, and hence identify the key drivers (mechanisms) behind that. To achieve this aim, several routine change (Feldman, 2000; Feldman et al., 2003; Zollo et al., 2002) related concepts, firm strategy concepts and team development theories have been examined, to provide the basic conceptual frame.

The expected contribution to the engineering sciences is to support collaboration-tool software engineers to define new development requirements for supporting the network project works.

To managerial practice, this thesis is expected to offer drivers (mechanisms) which are critical to enabling routinisation in network organisations. Concrete examples are derived from the three engineering network study cases. The results are expected to provide an increased understanding of the complex work and social structuring that project managers have to face when working under network organisations.

1.4. THESIS OUTLINE

The introduction chapter sets the research objectives, questions and design of this dissertation. Expected contributions to the study and the thesis structure are also provided.

Chapter 2 initially consists of a literature review covering three different fields: team interactions, organisational routines, and organisational capabilities. These three fields

of literature provide different definitions and study methods on routinisation from the perspective of team, operation and strategy. These three different perspectives of routinisation are then reflected against the actual organisational structures of network organisations. From the outcomes of theoretical reflections, I propose to adopt a grounded theory approach to further study network projects across time, to gain a better understanding of how routinisation takes place in network organisations.

The empirical part of the study starts with the third chapter. In this chapter I introduce the characteristics of the longitudinal case study research approach. I also describe detailed steps on how routinisation can be identified and captured across network projects. The results of the three case studies are presented in chapter 4 of this thesis.

Chapter 5 analyses and discusses the case studies in order to identify the mechanisms which enables routinisation in network organisations. The outcomes are then discussed and compared with theoretical discussions in chapter 2.

The final chapter of this dissertation reflects the initial research questions and the theoretical and practical contribution of the dissertation. Limitations and future research recommendations are also discussed.

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│        Introduction         │
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**Theoretical part**
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│  Conceptual Understanding of│
│        Routinisation        │
│        (Chapter 2)          │
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**Empirical part**
┌─────────────────────────────┐
│        Study Design         │
│        (Chapter 3)          │
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│        Study Cases          │
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│    Analysis and Discussion  │
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│   Summary and Conclusion    │
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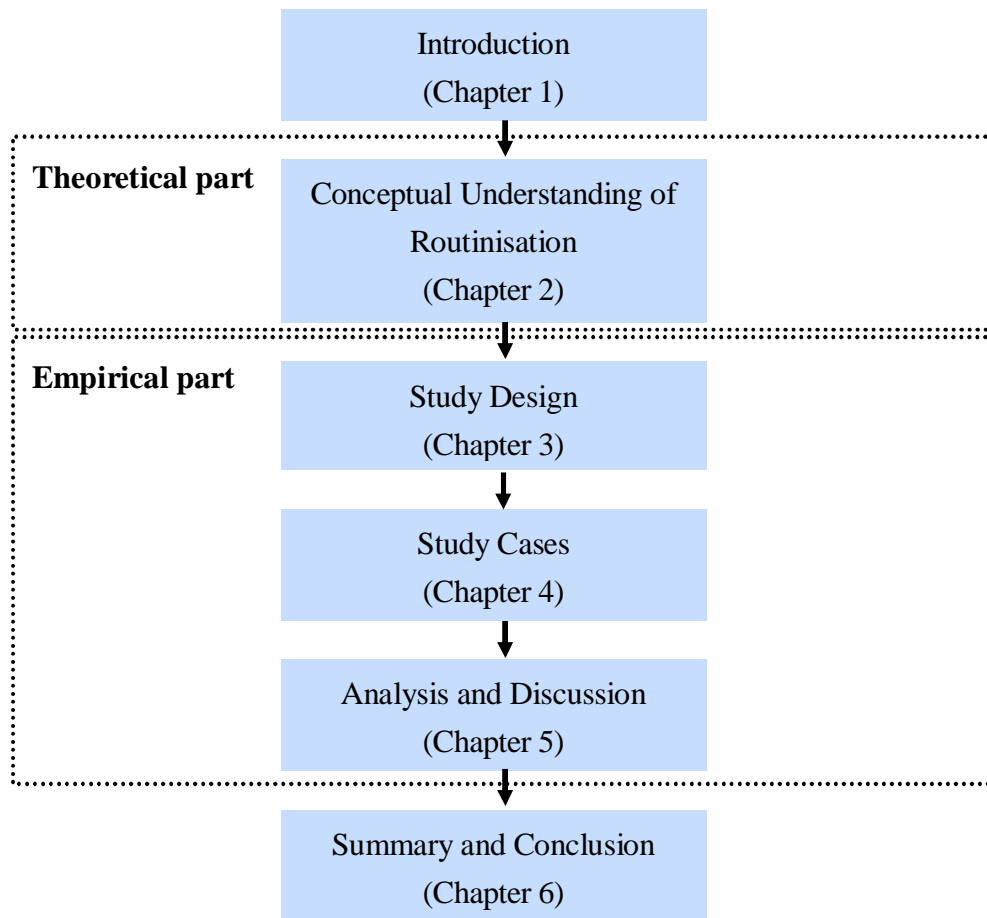
Figure 1: General dissertation outline

2. CONCEPTUAL UNDERSTANDINGS OF ROUTINISATION

2.1. INTRODUCTION

Routine (noun): the act of working with another person or group of people to create or produce

Oxford English Dictionary

"Routine", by basic definition is about standard work procedures which people follow to accomplish their work (Oxford English Dictionary). Routines also provide the basic structures required for effective collaborative-actions in firms (March & Simon, 1958; Stinchcombe, 1990). Nevertheless, with today's dynamic environment, firms are being forced to become more agile or establish new organisational forms such as network organisations. Under these changes of business environment, several researchers have started to redefine the properties of routines in today's environment. Therefore the objective of this chapter is to review these different perspectives of routines from different fields of research, and hence lead to better understanding on how routines are created, especially in network organisations.

This chapter consists of six sections. Section 2.2 indicates the importance to study routinisation in nework organisations. Sections 2.3 to 2.5 discuss routinisation from perspectives of team interactions, firm operation and capability of firms respectively. Each of these different perspectives offers different theoretical views on routinisation.

Through analysis of these different perspectives, in section 2.6 and 2.7 the discussions will focus on new approaches for studying routinisation in network organisations.

Prior start of this chapter, I would like to make a distinction between routine, work practice and process. The main distinction of routine with work practice and work process is that routine is a collective action of more than two persons instead of single person's action. Another distinction is that routine might not consist of sequential steps of action descriptions, which would be the case in a work process, but could be a common pattern of interaction behaviour between different persons.

2.2. ROUTINISATION AS A NEW DIMETION FOR STUDYING NETWORK ORGANISATIONS

2.2.1 Success or failure of networks depends on the evolution and management of the networks

A network is an organisation that brings together different firms that have different working structures and cultures, but that collaborate to achieve commonly shared strategic business objectives. In the past decade, many scholars of organisation theory and strategic management have published works on this new organisational form (Gerlach, 1992; Human & Provan, 2000; Jarillo, 1988; Jones, Hesterly, & Borgatti, 1997; Miles & Snow, 1986; Powell, 1990). Increasing cooperation between European buyers and Asian suppliers, European networks of regional SMEs, global joint ventures and alliances are the main motives behind these increasing explorative studies on networks (Gerlach, 1992; Yan & Gray, 2004).

To explore how networks operate and are created, researchers have focused on different perspectives of networks, such as structure (Ahuja & Carley, 1999; Hanssen-Bauer &

Snow, 1996), governance mechanisms (Jones et al., 1997; Katzy, 1998), processes of evolution (Arino & Torre, 1998; Hanssen-Bauer et al., 1996; Human et al., 2000). As (Miles et al., 1992) have pointed out: *"network organisations' failures are caused not by the inappropriateness of the network form but because of managerial mistakes in designing or operating it."* Therefore a study of how networks evolve over time and the management practices that develop is important for the success or failure of networks.

2.2.2 **Routinisation is important to gain an understanding of networks' evolution and management**

Although several different explorative studies have been carried out on the evolution of networks and their management structure, more in-depth studies are still required to enrich our understanding on networks. (Hanssen-Bauer et al., 1996)'s longitudinal case study on a Norwegian regional network is one of the few in-depth studies on networks. In their study, the continuity of learning is an important conceptual outcome and key driver for ongoing development and success of the network. A model of the learning process (Figure 2) and key success factors for each stage are also presented in their study.
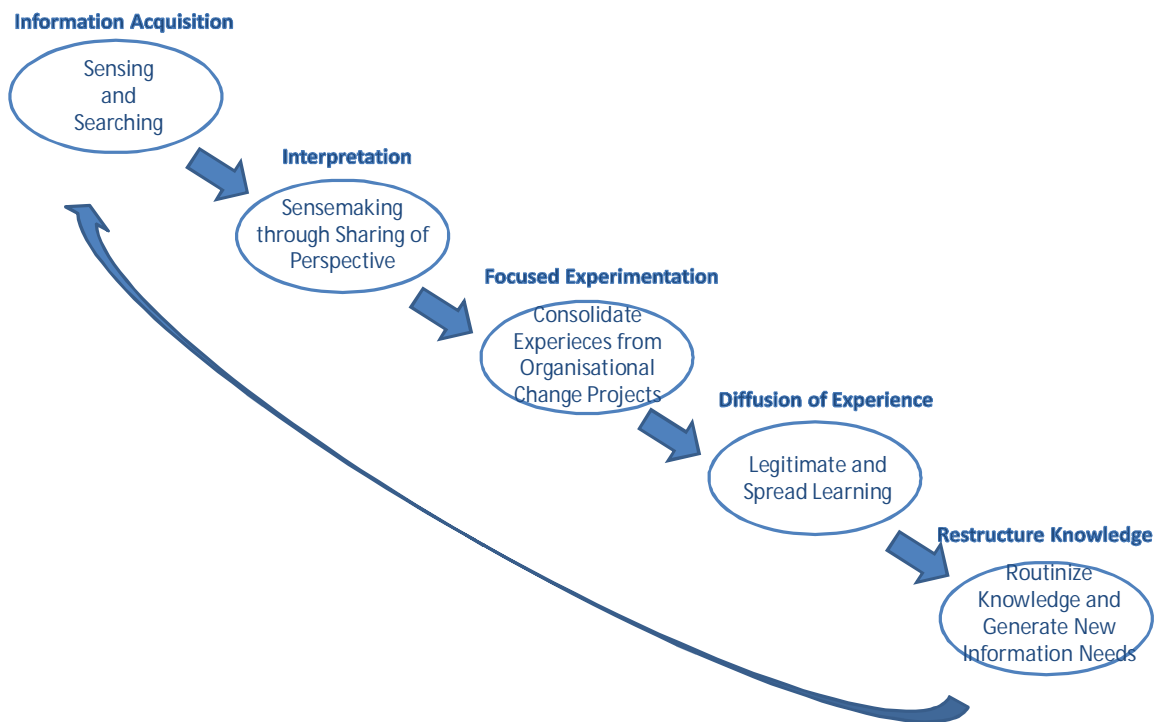
Figure 2: Nordvest forum's learning Cycle

Nevertheless, the network case presented by (Hanssen-Bauer et al., 1996) is by nature a collective regional learning network, therefore less political and culture differences and conflicts are expected than in other strategic alliances which would be expected to require more integration for collaboration. On the other hand, this is only a single case study, and thus it is difficult to generalise the results for wider adaptation and use. Another study by (Human et al., 2000) has focused on how networks build legitimacy from the early pre-network phase toward a sustainment or demise phase. In their study, two longitudinal case studies were carried out and five different stages and their corresponding critical factors were identified (Table 1).

Stage of network evolution	Critical factors in each stage		
Pre-network	• Orgnizational field legitimacy of cooperation as a competitive strategy	• Legitimacy of the industry locally and its organizational field	• Key stakeholders
Network formation	• Initial legitimacy building focusing primarily on network as form and network as entity	• Emergence of different strategic orientations for legitimacy building	
Early growth	• Clear differences in legitimacy building strategy by NAO	• Growing pains/ legitimacy setbacks	
Emerging legitimacy	• Deficiencies overemphasis of internal or external strategic orientation		
Sustainment or demise	• Need for both internal and external strategic orientations for network legitimacy building	• Continued legitimacy deficiencies result in demise of formal network	

Table 1: Network stage evolution and critical factors

(Human et al., 2000)'s study offers interesting insights into how legitimacy is established across the lifecycle of networks, but limited insights are provided on how cooperation processes are actually established and evolved. Other authors like (Sydow, 1996; Sydow & Windeler, 1995, 1998) have taken a social structuration perspective to analyse how networks actually operate. Based on (Giddens, 1991)'s social structuration framework (Sydow et al., 1998) have tried to explain how human interaction and organisation structure relate and affect each other, and hence shape the evolution and development of networks. Nevertheless, these studies did not go further to discover the actual evolution of cooperation processes evolve over time.

Despite the use of different conceptual approaches for better understanding of networks, there are still limited studies on how networks actually operate across different stages of their lifecycle. Therefore more longitudinal case studies are still required. In this study, routinisation will be adopted as the basic conceptual lens for studying networks. According to organisation studies, routines are important structures for maintaining the stable operation of firms. On the other hand, according to (Giddens, 1991)'s social structuration theory, routines reflects the actors' continuous changes in action and the social structure around them. Therefore studying how routines are established across network lifecycle will help to better understand how the different firms actually interact and cooperate in networks across different periods of time.

2.3. ROUTINISATION OF TEAMWORK AS STRUCTURED INTERACTIONS

From the perspective of team interaction, routinisation is a structured process that result in common patterns of interactions between the team members (Massey et al., 2002; Wood et al., 1991). Recently, with increasing numbers of collaborative projects in network organisations, routinisation of team interactions has become an important topic for research (Belanger, 1999; Burn et al., 1999; Bush & Frohman, 1991; Jarvenpaa & Leidner, 1999; Scott & Timmerman, 1999; Suchan & Hayzak, 2001; Tan, Wei, Huang, & Ng, 2000; Thompson & Feldman, 1998; Watson Fritz, Narasimhan, & Rhee, 1998). Team development processes, establishing communication structures, IT enabling interactions and coordination of team interactions have been discussed as possible ways of structuring the interactions (routinisation) between team members and accomplishing work. Therefore the focus of this section is to discuss these different ways of structuring team interactions, and hence contribute to the overall conceptual understanding of routinisation.

2.3.1 Communicate to structure virtual team's interactions

Communication is the basic action in which team members interact and accomplish work. As (Tan et al., 2000) argued:

> *"Team collaboration is the extent to which team members can openly communicate and help each other to overcome obstacles and finding solutions."*

Therefore communication enables structuring of the normative behaviour of people or teams in firms (Johnson, 1993). However, in the context of network organisations, teams are often virtually distributed, and communications are mostly mediated through different kinds of information and communication technologies (ICT) (Glffin, 2002; Guss, 1998). Therefore lack of rich social cues (Sproull & Kiesler, 1986) has impacted the way in which communication can structure the actions between team members. Others have further reported that teams could get stuck in different defensive routines (Dixon, 1993) such as lack of trust in sharing information, which could potentially prohibit routinisation that would lead to better collaborations. Furthermore, some of the virtual team communication researchers (Hiltz, Johnson, & Turoff, 1986) have discovered that virtual team communication tends to be more task-oriented than in a face-to-face team. Others have also reported that virtual teams exchange fewer remarks than the face-to-face teams (Siegel, Dubrovsky, Kiesler, & McGuire, 1986). These findings on virtual team communication have clearly addressed the barriers to enabling routinisations in network teams. However further investigations are required on how to enable routinisation and hence improve team interactions.

IT enablers to team communication are another team communication perspective on how team interactions could be structured. IT has played an important role to bridge the

time and space, and provided support on information exchange and communication (Rockart & Short, 1991). In network teams, the majority of the team members' communication and interactions are mediated through IT (Burke, Aytes, Chidambaram, & Johnson, 1999; Burn et al., 1999; Carmel, 1999; DeSanctis & Gallupe, 1987; Manheim, 1993; Qureshi & Vogel, 2001). Therefore some authors like (Orlikowski & Barley, 2001) have argued that IT is not only a physical artefact but embedded in different social system such as team.

Nevertheless, the majority of the existing researches on how IT structures communications still very much focussing on task-oriented activities. For example, research on team decision support (DeSanctis et al., 1987) often uses a single team to perform relatively simple tasks with a limited set of tool functionalities arbitrarily assigned by an experimenter. And the experimental team exists only for a limited time without a past or future as a team, isolated rather than embedded in any large social units (organisation or network). Despite this, some causal relationships between technology and certain tasks have been found (Poole, 1978; Zigurs & Buckland, 1998; Zigurs, Poole, & DeSanctis, 1988), but the results are still far from generalisable (DeSanctis & Poole, 1994).

In summary, existing communication-oriented team interaction researches have pointed out the importance of routinisation to structuring of team interactions. Nevertheless, no further progress has been made to further the discussions beyond the task-driven communication. Therefore, there are limited contributions to the understanding of routinisation in network organisations from the current findings.

2.3.2   Coordinate to structure team's interactions

Coordination is an essential structuring mechanism in firms (Grant, 1996) that ensures productive interactions between team members. Similarly routines also provide the structures which coordinate work interactions in firms. In (Mintzberg, 1993)'s book on designing effective firm, he identified five different coordination mechanisms: mutual adjustment, direct supervision, standardisation of processes, standardisation of inputs and standardisation of outputs, for structuring the team interaction in firms. These coordination mechanisms are often enforced through hierarchical control of firms.

However, in a network project team, coordination is difficult to achieve, because there is a lack of an initial commonly shared reference interaction structure. Authors like (Kloppenborg et al., 1999) have pointed out:

> *"[…] Project teams often get stuck in different defensive routines that inhibit effective learning and may remain stuck unless these dysfunctional behaviours are changed […] "*

Therefore, how to harmonise the different defensive routines between the diverse project team members, and establish new (routinisation) routines that facilitate interactions has became a key challenge.

Researcher(s)	Coordination Approaches / Mechanisms
(McGrath, 1991)	• Schedule of activities • Synchronization of activities by different segments of the organisation • Allocation of temporal resources to project
(Mintzberg, 1993)	• Mutual adjustment • Direct supervision • Standardisation of processes, standardisation of inputs and outputs.
(Ocker, Hiltz, Turoff, & Fjermestad, 1995)	• Sequenced or structured processes for work and problem solving • Mechanism for group communication
(Helbrough, 1995)	• Meetings (face-to-face or virtual)
(Sarker, 2002)	• Routinising interactions through social norms • Adopting norms of messaging • Using synchronous and media rich technologies to create an illusion of social presence • Making work processes visible to all • Aligning frames of reference by seeking out sources of knowledge
(Ramesh, 2002)	• Routine collaboration activities • Mature work processes with well-defined task deliverables and the processes
(Massey et al., 2002)	• Schedule deadline • Coordinated pace of effort within or between team members • Specification of time spent on specific tasks

Table 2: Project Team Collaboration Coordination Mechanisms

Recently several team coordination researchers have tried to understand what mechanisms are required to enable interactions for distributed project teams (Table 2). In (Zigurs et al., 2001)'s study on virtual project teams, six different types of coordination mechanisms have been discussed (see Table 3). Apart from task and media coordination, other coordination approaches are required to take into consideration

ongoing change and evolving team structures. Similarly in (McGrath, 1991)'s paper on time, interaction, and performance (TIP) theory of groups, he also pointed out that:

> *"A significant problem facing dispersed teams is coordinating the temporal patterns of team behaviour."*

(Sarker, 2002) also points out the importance of time and change dimensions of virtual team interactions, and suggests that routinising team interactions is strongly associated with establishment of common social norms. Therefore from the reviews of current team coordination literature, traditional authority-oriented coordination mechanisms can no longer be applied to distributed project teams such as network project teams. Instead better understanding of routinisation process of team interactions has become important.

Aspects	Characteristics
Task coordination	Same in both traditional and virtual. Examines how actors, activities, goals, and resources combine in diverse systems, with the objective of identifying patterns of coordination problems that arise from dependencies in how tasks can be performed.
Relational coordination	In traditional projects and groups, trust builds over time through shared experiences. In distributed groups, trust must develop swiftly.
Structural coordination	Traditionally achieved through well-established hierarchies, but in virtual projects, structure is not necessarily pre-defined but emerges and changes as the project evolves.
Temporal coordination	changes from a linear phenomenon to a non-linear and dynamic one. The little research that exists shows that virtual teams have serious difficulties with temporal coordination (Cramton, 2000)
Role coordination	Role coordination in traditional projects is reinforced through hierarchies. In virtual projects, roles are based on competencies that change over time, and new roles such as liaison and gatekeeper become important.
Media coordination	New perspective means being able to communicate over diverse types of channels using media of highly variant characteristics.

Table 3: Different aspects of Coordination

2.3.3 Routinisation of teamwork through ongoing team development

Studies on team development process address stages in which team interactions are evolving and structuring. (Massey et al., 2002) cite Poole and Roth (1989) in their paper on global virtual project teams. They have argued that:

> *"Successful team outcomes depend largely on the nature of a team's interaction processes: i.e. the intertwining threads of activity that evolve simultaneously and interlock in different patterns over time (Poole & Roth, 1989)."*

Team development concepts provide a process view on how team interactions are structured, adding to the overall understanding of routinisation. Therefore, the focus of this section is to examine existing team development process concepts, and hence to provide a more dynamic view on routinisation when compared to communication and coordination perspectives of team interactions.

2.3.3.1. Linear Team Interaction Model

Team interaction is not only about communication and coordination of work, but also closely relates to process of social structuring between the team members. Overall there are two main traditional streams of research on team structuring processes: team dynamics and phases in team problem solving (Gersick, 1988).

Studies on team dynamics started in the late 1940s, with focus on psychosocial and emotional aspects of team life (Gersick, 1988). Researchers explored several aspects influencing team members' ability to interact effectively across the lifespan of a team, such as dependency, control and intimacy. Later on, (Tuckman, 1965) synthesised these studies into a linear sequential model which consists of four stages: forming, storming, norming and performing. Following similar logic, other researchers like (Hare, 1976), (LaCoursiere, 1980), and (McGrath, 1986) also proposed similar sequence models based on (Tuckman et al., 1977)'s updated model (see Table 4).

Researcher(s)	Team dynamic models
(Tuckman, 1965; Tuckman et al., 1977)	Forming, storming, norming and performing
(Hare, 1976)	Define the situation, develop new skills, develop appropriate roles, carry out the work
(LaCoursiere, 1980)	Orientation, dissatisfaction, resolution, production, and termination
(McGrath, 1986)	Generate plans, ideas & goals ; choose/agree on alternatives, goals, and policies ; resolve conflicts and develop norms; perform action tasks and maintain cohesion

Table 4: Team dynamic models

The other stream on team structuring process research has focussed on team problem solving, and decision-making processes (Gersick, 1988). These studies have focussed on discovering the sequences of activities through which teams empirically reach solutions. Most of the studies were carried out in laboratory settings, in which the target teamsonly existed for a short lifespan and performed limited tasks to solve a specific problem. One of the well-known studies in this area is (Bales & Strodtbeck, 1951)'s sequential model of three phases in a group's movement towards goals: orientation, evaluation, and control (Gersick, 1988).

These linear sequential process models of team structuring can offer a good theoretical understanding on phases that teams have to go through before common interaction routines can be established. In (Zigurs et al., 2001)'s study on virtual project management, (Tuckman et al., 1977)'s stage model has been adopted as the basic process framework for identifying problems that might occur during the collaboration lifecycle of a virtual project team.

Nevertheless, there are also several criticisms concerning whether these concepts can really be applied to capture the actual dynamic of team interactions. In (Gersick, 1988)'s paper, he has critically addressed lack of clear descriptions on the mechanisms that trigger the changes between the different process stages of the linear model.

> *"[…] they offer snapshots of groups at different point in their life-spans but say little about the mechanisms of change, what triggers it" (Gersick, 1988)*

Further more, (Gersick, 1988) also criticise that:

> *"[…] existing model have treated groups as closed systems. Without guidance on the interplay between a group's development and environmental contingencies [...]"*

Others, like (Fisher, 1970) and (Poole, 1983) have also noted that team discussion and decision-making should proceed in a interactive cycle and multi-sequence respectively, instead of following a linear model as suggested by (Tuckman et al., 1977) and others. Therefore these concepts can only be used as initial reference models for studying routinisation in teams, and more explorative empirical work isneeded to better capture the change mechanisms which drive the process.

2.3.3.2.   Time, Interaction and Performance Interaction Model

Recently (McGrath, 1991) has attempted to construct a new conceptual model that reflects the more dynamic structuring process of a team: the Time, Interaction and Performance (TIP) interaction model. This model emphasizes temporal patterning of interactions (routines) and performance of a team. Unlike pervious team dynamic and problem-solving team development theories, the TIP model focuses on teams'

unconstrained settings. Under such settings, the team members are subjected to variable membership, but have had a past together and expect to have future. This approach can better reflect the actual situation of network project team.

FUNCTIONS

MODES	Production	Well-being	Member Support
Mode I Inception	Production Demand/ Opportunity	Interaction Demand/ Opportunity	Inclusion Demand/ Opportunity
Mode II Problem Solving	Technical Problem Solving	Role Network Definition	Position/ Status Attainments
Mode III Conflict Resolution	Policy Conflict Resolution	Power/ Payoff Distribution	Contribution/ Payoff Relationships
Mode IV Execution	Performance	Interaction	Participation

Figure 3: Team Interaction Framework- functions and modes[1]

In (McGrath, 1991)'s TIP model, he has argued that teams are multifunctional and perform three common routine activities: production (i.e. performance of work), well-being (i.e. social interaction with other team members) and member support (i.e. participation in teamwork). In addition, teams often carry out one or more of four modes of team activity: inception and acceptance of a project, solution of technical issues, resolution of conflict, and execution the performance requirements of the project (Figure 3).

Further more (McGrath, 1991), has pointed out three generic temporal problems faced during team interaction: temporal ambiguity (when particular events will occur and

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[1] McGrath, J. E. 1991. Time, interaction, and performance(TIP) A Theory of Groups. *Small Group Research*, 22(2): 147-174.

recur and how long they will last), conflicting temporal interests and requirements, and scarcity of temporal resources. Traditional firm approaches to these problems are scheduling of activities, synchronization (aligning the pace of effort with and between members), and allocation of resources (Massey et al., 2002; McGrath, 1991).

Although this new theoretical model proposed by (McGrath, 1991) has provided a more realistic construct to reflect today's team interactions, especially for network project teams, this model was nevertheless developed based on a single firm setting. Therefore to have a better understanding of the routinisation process of network project teams, further empirical studies on the full lifecycle of network project teams are required.

2.3.4 Routinisation of team interactions

Recently increasing conceptual awareness has developed regarding how routines could help to structure complex interactions between the virtual team members (Ramesh, 2002; Sarker, 2002).

> *"[…] many of the projects undertaken by global virtual teams are often*
>
> *not well-defined repeatable or routine activities." (Ramesh, 2002)*

In (Ramesh, 2002)'s paper, he has suggested using routines or mature work processes with well-defined task deliverables and the processes to structure the "formal" collaboration between the virtual team members. On the other hand, authors like (Sarker, 2002) have suggested a common social norm also needs to be established in order to enable interactions between the team members.

Nevertheless, most of these existing studies on how routinisation of virtual team interactions between virtual project team members could occur are still in the early phases. As (Ramesh, 2002) described:

"[…] we believe that some proportion of virtual teams do engage in routine processes […] processes that may not be formally well-defined but have the potential to be […]"

Therefore more empirical studies are still required to further the concept development.

2.4. ROUTINISATION AS STRUCTURES AND PROCESSES CHANGE IN FIRMS

Routines are important structures for regulating or coordinating collective actions in firms (Baba & Jamal, 1991; Cohen et al., 1994; Pentland et al., 1994).

"Without routines, organisations would not be efficient structures for collective action." (Cohen et al., 1994)

Similarly in a review on organisational routines literature (Becker, 2004) identified some of the main characteristics of routines and their effects on firms.

Characteristic	Effects on firms
• Patterns	• Coordination and control
• Recurrence	• Truce
• Collective	• Economizing on cognitive resources
• Mindlessness / effortful accomplishment	• Reducing uncertainty
• Processual	• Stability
• Context-dependence, embeddedness and specificity	• Storing knowledge

Table 5: Characteristics of routines and their effect on organisations

Since the introduction of the concept of routines by (Cyert & March, 1963), the understanding of routines in this context has always been standard firm operation procedures that are the result of accumulation of know-how over time. Despite wide use of the term routines, few studies have tried to further theory development on routines. Recently a few routine researchers have urged further exploration of routinisation for better theoretical understanding of routines.

"The many studies do not seem to have yielded a better theoretical understanding of routines themselves – where they come from and how they change." (Cohen et al., 1994)

This new theoretical development on routines has provided an important basis for understanding of routinisation in network organisations. Because unlike in firms, network organisations are often subjected to structural changes (Katzy, 1998; Sydow et al., 1998) or take a relatively long period of time to establish initial collaboration structures (Hanssen-Bauer et al., 1996). Therefore the focus of this section is to review the contemporary theory developments of routines at the firm level, and hence identify the gaps in studies of routinisation in network organisations.

2.4.1   Routinisation as a result of contingent reactions

Earlier definitions of routines (Cyert et al., 1963; March & Simon, 1958; Nelson & Winter, 1981; Taylor, 1947) are stable and rule-based and routines often exist in the form of a written rule manual, policy manual, evaluation procedures and job descriptions (Ashforth et al., 1988; Hage & Aiken, 1969; Weiss et al., 1985). Table 6 shows two sets of criteria that are suggested by researchers to measure degrees of routinisation in firms.

Author	Routine criteria
(Hage et al., 1969)	**Degree of centralisation:** • Degree of participation in organisational decisions • Degree of hierarchy of authority in work decisions **Degree of formalisation:** • Degree of job codification • Degree of rule observation • Presence of a rules manual • Presence of job descriptions • Degree of specificity of job description
(Ashforth et al., 1988)	• The presence of an event schema • Categorisable stimulus cues • The presence of action rules • Minimal required effort • The absence of unstructured subroutines • The absence of interruptions and expectations

Table 6: Relationship between routine work and social structure

Some authors have considered these rule- or procedure-based routines as mindless repetitions of actions (Ashforth et al., 1988; March et al., 1958), inertia (Hannan & Freeman, 1983), and inflexibility (Gersick & Hackman, 1990) for change. Therefore, firms that operate based on standard rule- or procedure-based routines are those which have greater centralization of decision-making and power of control (Hage, 1974; Hage et al., 1969). In another study by (Ashforth et al., 1988), they conclude that this kind of mindless behaviour is commonplace in operating routines, decision making, formal and informal interaction, and power-based interactions (Pentland et al., 1994).

Regardless of the fact that routines have been understood as standard operating procedures or rules, and inflexible (Gersick et al., 1990), they are, in fact, subject to changes, as (Feldman et al., 2003) pointed out:

> *"Routines also change in old, established organizations in stable environments."*

In the earlier literature, changes of routines only occur when there is either a crisis in the firm (Gersick et al., 1990) or under ambiguity (Miner, 1990). (Cyert et al., 1963) referred to this as adaptation, and (Nelson et al., 1981) called it mutation. Therefore routines are very much re-enacting the past, and stable, unless there are major crises or failures which will seriously impact the efficiency brought by the routines (March et al., 1958; Stinchcombe, 1990). (Gersick et al., 1990) provided five conditions under which rule-based routines might change:

- encountering a novel state of affairs

- experiencing a failure

- reaching a milestone in the life or work of the group

- receiving an intervention that calls members' attention to their group norms

- having to cope with a change in the structure of the group itself

Similarly (Naduzzo, Rocco, & Warglien, 2000) have also pointed out that changes in routines only occur during the start-up phase of a new firm. Therefore, under the rule based definition of routines, routinisation doesn't occur systematically over time unless there is an entirely new creation triggered by a "defect" in old established routines.

In (Baba et al., 1991)'s paper, they pointed out that this definition of routines (standardisation rule or work procedure) are narrow and restrictive views of the concept, and do not incorporate the human relationship aspects which humanistic psychologists claim are bad for both individual performance and organisational productivity. Others,

like (Oldham & Hackman, 1980) have also criticised the rule-based perspective of routines as it:

> *"[…] suppresses innovation, commitment and other forms of creative expression on the job."*

These reviews are particularly important in studying routinisation in network organisations, because the network project teams often start without any common social and working structures. And dynamic social relationship and innovation are the basic environmental background of network organisations. Thus a more dynamic view on rule-based routines, especially the creation/evolution processes of routines, is required to better reflect routinisation under the setting of network organisations.

2.4.2   Routinisation as a sequential change pattern of behaviour

Apart from routines as standard rule or work procedure, repeated patterns of behaviours are another commonly accepted interpretation of routines (Table 7). Under this definition, routines no longer mean explicitly written rules, but could be either explicit or implicit repeated patterns of behaviour.

Nevertheless, it is only recently that authors like (Pentland et al., 1994) have started to explore the dynamic aspect of routines.

> *"Organisational routine can be seen as a set of possible patterns that need not be fixed or automatic."* (Pentland et al., 1994)

(Pentland et al., 1994)'s paper explored the sequential structure of work processes in a task team whose work involved high numbers of exceptions, frequent interruptions and extensive deliberation, and could not be characterized as routine under any traditional

definition. However the results of 168 service interactions reveal that most interactions follow a repetitive, functionally similar pattern.

Authors	Definition
(Gersick et al., 1990)	A habitual routine exists when a group repeatedly exhibits a functionally similar pattern of behaviour in a given stimulus situation without explicitly selecting it over alternative ways of behaving.
(Pentland et al., 1994)	Organisational routine can be seen as a set of possible patterns that need not be fixed or automatic
(Cohen et al., 1994)	A functionally similar pattern of behaviour in a given stimulus situation, without explicitly selecting it over alternative ways of behaving.
(Nelson et al., 1981)	Our general term for all regular and predictable behavioural patterns of firms is routine.

Table 7: Definitions of Routines

To answer this conceptual contradiction, (Pentland et al., 1994) have made a distinction between routines as of action and routines as a variable property of such patterns. In their analogy, they have treated routines as sequential structures of the patterns. Under this analogy, routines often have subroutines that can be rearranged and combined to form new routines.

In (Mintzberg, 1976)'s paper on the structure of unstructured decision process, they have taken a similar approach to examine the subroutines for non-routine activities. After analysing twenty-five strategic decision processes, they identified three common subroutines which could be used to support the different unstructured strategic decision making.

Nevertheless, (Pentland et al., 1994)'s study only opens up the dynamic perspective of routines which are made up of several subroutines, and these subroutines might not be

fixed rules, but similar patterns of behaviours. However further exploration is required to find out what actions drive the changes.

> *"(Giddens, 1984) and others have argued, rules, norms, schema, scripts and other cognitive artefacts are only 'resource' for action, but they cannot be understood as determining action."(Pentland et al., 1994)*

2.4.3   Routinisation as a continuous process of change

Recently, a few researchers into routine (Feldman, 2000; Feldman et al., 2003) have tried to further expand the dynamic understanding of routines by making the assumption that: "routines are continuously changing". Similarly (Gersick et al., 1990) has pointed out that:

> *"Routines are repetitive patterns of action that are functionally similar, but not necessarily fixed."*

In (Feldman et al., 2003)'s case study on residential operation routines, they have discovered that routines are actions of "effortful accomplishment", not mindless like the fixed operational rules and guidelines, and through ongoing reflection of idea-action-plan-outcome the changes are continuous.

> *"Variation is a common part of organisational routines in large part because they are not mindless but effortful accomplishment […] change is more than choosing from among a repertoire of responses, and that the repertoire itself, and the rules that govern choice within a repertoire can also change." (Feldman, 2000)*

Thus it is the internal dynamics of the routine (idea-action-outcome) that drive the changes (Feldman, 2000). Furthermore, (Feldman, 2000) has pointed out two kinds of outcomes that are implicated in continuous change:

- Outcomes that fall short of ideals, which motivate continued striving

- Outcomes that present new opportunities, expanding the notion of what is possible and worth trying

To operationalise these theoretical conceptual ideas (Feldman, 2000; Feldman et al., 2003) used the term "performative", which is adopted from (Latour, 1986) to describe this new perspective of understanding of routine changes. By combining the human agency aspect of routine, (Feldman, 2000) has suggested:

"Performative routine as a flow that includes the broad range of thoughts, feelings, and actions that people experience as they engage in work."
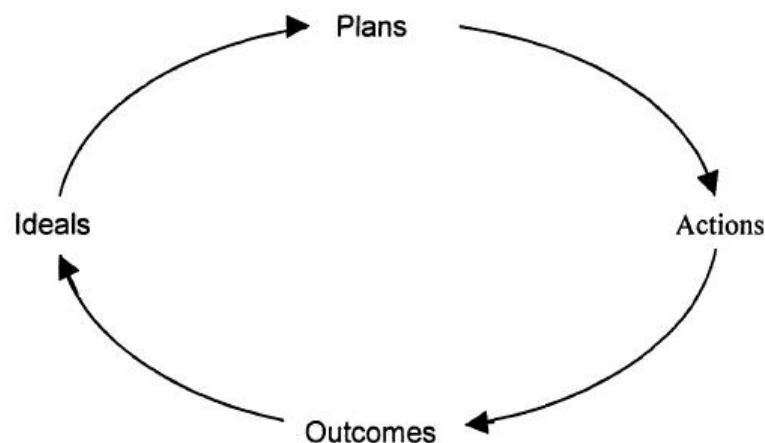
Figure 4: A Performative Model of Routinisation[2]

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[2] Feldman, M. S. 2000. Organizational Routines as a Source of Continuous Change. **Organisation Science**, 11(6): 611 -629.

Figure 4 shows a schematic form of this idea. Plans and actions produce outcomes that influence in conjunction with ideals or values; then, by comparing this with previous plan, new ideals will be provided for next iteration. In terms of definition of ideals and actions (Feldman, 2000) has identified three change "actions" which the agent will undertake when unintended and undesirable outcomes occurr, and a few categories of ideals influences (Table 8).

Constructs	Definitions
Ideals	Normative influences that include values, goals, missions, and expectations
Actions	When actions do not produce the intended outcome an unintended and undesirable outcome, participants can respond by repairing the routine
	When the outcomes enable new opportunities, participants have the option of extending. They can change the routine to take advantage of the new possibilities.
	When outcomes fall short of ideals, they can respond by striving. Unlike repairing, striving is, by definition, attempting to attain something that is difficult.

Table 8: Definition of ideals and actions

Despite this, there are several of initiatives to explore this change aspect of routine, but most of the studies are single explorative case studies (Feldman, 2000; Feldman et al., 2003) or experimental simulations (Cohen et al., 1994). Furthermore, these studies are based on single firms, in which one single authority still dominates. Therefore more empirical and in-depth explorative cases are still needed to provide better understanding

of how routines are created and evolved (routinisation), especially under the setting of network organisations.

2.5. ROUTINISATION AS AN ORGANISATIONAL LEARNING CAPABILITY

Routines provide not only the structural stability in firms for effective collective actions, but also important strategic capabilities if ongoing learning is captured and reflected (Eisenhardt et al., 2000; Zollo et al., 2002). Different from the traditional definition of a firm's operational routines, routines under the perspective of dynamic capability mean strategic processes like product development, alliancing and strategic decision-making that create value for firms (Eisenhardt et al., 2000).

> *"[…] dynamic capabilities resemble the traditional conception of routines (Cyert et al., 1963; Nelson et al., 1981) […] that is, they are complicated, detailed, analytic processes that rely extensively on existing knowledge and linear execution to produce predictable outcomes."(Eisenhardt et al., 2000)*

These routines are critical to firms in keeping their strategic market positioning, and in reacting to the dynamic market environment change these routines are often subjecting to change. Researchers into dynamic capability have pointed out that learning to change and modify routines is the key driver to keep the firm competitive in the market.

> *"A dynamic capability is a learned and stable pattern of collective activity through which the organisation systematically generates and modifies its operating routines in pursuit of improved effectiveness." (Zollo et al., 2002)*

(Zollo et al., 2002) proposed a model for routine changes through learning (Figure 5). In this model, knowledge articulation and codification have been pointed out as important learning mechanisms to drive the process of routinisation. A review of existing organisational learning literature (Huber, 1991; Levitt & March, 1986; Lyles, 1988; Shrivastava, 1983; Zollo et al., 2002) identifies other important learning mechanisms. (Huber, 1991) identified four main constructs and processes of learning: knowledge acquisition, information distribution, information interpretation, and organisational memory (Figure 6).
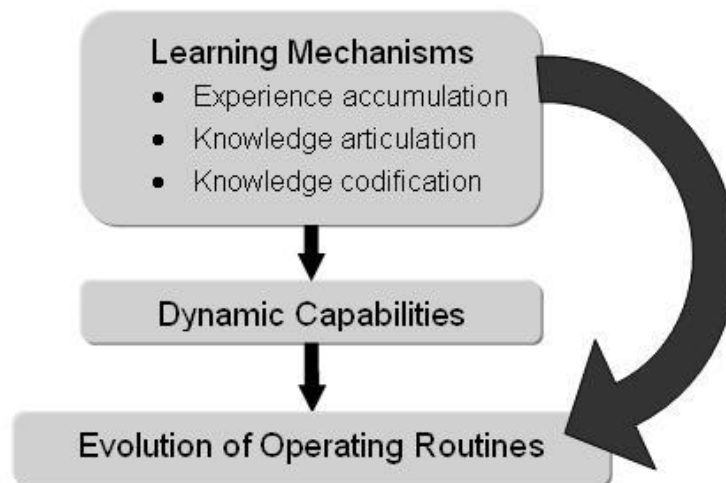
Figure 5: Learning, dynamic capabilities, and operating routines[3]

Nevertheless, In terms of mechanisms of learning to change, earlier organisational learning researcher like (Argyris, 1976) have suggested double loop learning as a way to question and change the fundamental design, goals and activities in a firm, rather than just learn to perform, as opposed to (Zollo et al., 2002)'s single loop of learning. Thus it is iterative and changes continuously.

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[3] Zollo, M., & Winter, S. G. 2002. Deliberate learning and the evolution of dynamic capabilities. **Organisation Science**, 13: 339-351.

Constructs and Processes

- 1.0 *Knowledge Acquisition*
  - 1.1 *Congenital Learning*
  - 1.2 *Experiential Learning*
    - 1.2.1 Organizational experiments
    - 1.2.2 Organizational self-appraisal
    - 1.2.3 Experimenting organizations
    - 1.2.4 Unintentional or unsystematic learning
    - 1.2.5 Experience-based learning curves
  - 1.3 *Vicarious Learning*
  - 1.4 *Grafting*
  - 1.5 *Searching and Noticing*
    - 1.5.1 Scanning
    - 1.5.2 Focused search
    - 1.5.3 Performance monitoring
- 2.0 *Information Distribution*
- 3.0 *Information Interpretation*
  - 3.1 *Cognitive Maps and Framing*
  - 3.2 *Media Richness*
  - 3.3 *Information Overload*
  - 3.4 *Unlearning*
- 4.0 *Organizational Memory*
  - 4.1 *Storing and Retrieving Information*
  - 4.2 *Computer-Based Organizational Memory*

Figure 6: Constructs and processes associated with organisational learning[4]

Form the review of dynamic capability literature, routinisation at firms' strategic level is strongly associated with the firms' ongoing learning mechanism. It is not only learning to react, but continuous learning, as proposed by (Argyris, 1976). If one refers back to team level analysis of routinisation, (Cohen et al., 1994) have argued that:

> *"Organisational routines emerge from the interaction of procedurally remembering individuals."*

This implies routinisation is a process of ongoing multiple actors learning to articulate and accumulate knowledge. Thus to study routinisation in network organisations, longitudinal analysis of ongoing structuring of agent and existing routines is required.

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[4] Huber, G. P. 1991. Organisational Learning: The contributing processes and the literatures. *Organisation Science*, 2(1): 88-115.

2.6. NETWORK ROUTINISATIONS ARE OUTCOMES OF LONGITUDINAL PROJECT LEARNING AND ACCUMULATION

Project management, as a management practice, was first introduced during the post–war period to manage large scale aerospace and construction projects (Crawford, 2000b). Most of these projects were well resourced, and led by project managers who had the definite authority for a single point of responsibility (Bechtel, 1989; Stretton, 1994). The collaboration between project team members was regulated through routines such as: extensive time planning, activities scheduling, cost performance of projects, and controlling of project inputs and outputs (Crawford, 2000b; Helbrough, 1995).

In network organisations, projects are often used for organising collaborative works between different network partner firms. Nevertheless, unlike traditional firm projects, network projects don't always have constant social structure and single control and command structure. Therefore social and organisational structuring is taking place while projects are being carried out.

The objective of this section is to first review existing project management practices and hence to identify limitations to apply to network projects. Based on these reviews, suggestions as to why further study on network projects can contribute to understanding of network routinisation will be made.

2.6.1   Project management as advance planning and scheduling of routines

Planning and scheduling oriented approaches for managing collaboration between project teams have been widely adopted and used across different industries (Barnes, 2002). Much effort is expended in searching for and developing methods and tools to support planning and scheduling. PMBoK (Project Management Institute- PMI) and

PRINCE2 (Central Computer and Telecommunications Agency-CCTA) are two of the most prominent structured collaboration methods developed in the field, with the basic definition (Table 9) that a project can be interpreted as a temporary organising entity that exists only to accomplish a definite objective (i.e. developing a business product or service).

Source	Definitions
PRINCE2 (CCTA, 2002)	• A management environment that is created for the purpose of delivering one or more business products according to a specified business case. • A temporary organization that is needed to produce a unique and predefined outcome or result at a pre-specified time using predetermined resources.
PMBoK (PMI, 2004)	• A project is a temporary endeavour undertaken to create a unique product, service, or result. • Project is a means of organizing activities that cannot be addressed within the organisation's normal operational limits. • Project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements.

Table 9: Definitions of a project

In terms of the actual content of the structured collaboration methods developed by both PMI and CCTA, a lifecycle planning approach is taken.

> *"A project has a lifecycle, which is the path and sequence through the various activities to produce the final product. The term 'life span' is used to describe the life of a product. The two should not be confused."*
>
> *(CCTA, 2002)*

Table 10 shows project lifecycle models with key collaboration components as proposed by both (PMI, 2004) and (CCTA, 2002). Extensive planning of

responsibilities, resources, and schedules is the key to ensuring successful collaboration between team members in a project, even when the team members have no prior collaboration experience (CCTA, 2002). Therefore, project management has long been considered by academics as a field for planning-oriented technique (Söderlund, 2004).

Source	Project Life Cycle
PMBoK (PMI, 2004)	
PRINCE 2 (CCTA, 2002)	

Table 10: Project lifecycle and key management components

To support extensive planning of project team collaborations, several tools and techniques have also been developed. Work Breakdown Structure (WBS) is often used as a first tool to provide the basis for planning, scheduling, budgeting and controlling.

WBS means the structured dismantling of the project into its various components and then successively into lower levels. The lowest level observed usually is the work package, a task or subtask which can be seen as a natural subdivision of a cost account. For the work package the responsible person(s), the job or a budget number can be identified, and it is where the project work will be done (Taylor, 1998), so the work packages are units that can be planned and controlled. The WBS then is presented either as a hierarchical tree structure or as a list in an indented format.

The WBS can be seen as a common base for all further planning steps. Adding activities leads to a process plan, determination of the sequence of the work packages to a network plan. Estimation of the needed resources, especially time and cost, for each work package provide the data to generate resource plans (PMI, 2004). Because of the interdependencies of the project activities, the time plan mostly is evolved from the network plan, a method of representing the tasks of the project by a series of lines and nodes to show the interrelations of the activities. Several network analysis tools have been developed, and two of the most common ones are: The critical path method (CPM) and The Program Evaluation and Review Technique (PERT). Table 11 provides a quick overall view of these two techniques.

Critical path method (CPM)	Program Evaluation and Review Technique (PERT)
• Estimation of the most commonly needed time to complete each individual task of the project • All tasks are put in relationship (e.g. B can start, when A is finished) and then, starting from the earliest possible beginning of the project and working through, the earliest possible end date is set.	• The tasks needed to complete a given project are analyzed, often based on a WBS. • The time needed for each task is estimated from an optimistic, most likely, and pessimistic point of view. The average time for each task is worked out, and from it the minimum time needed to complete the whole project is calculated.

Table 11: Characteristics of CPM and PERT techniques

While network diagrams are used to show the relationships of the tasks rather than focussing on the timeline, this is often done with a Gantt chart. In this kind of bar chart, the timing of the tasks identified with the WBS as they appear over time is shown. Because the relationships of the activities can be poorly identified from the "original" Gantt chart, which presents the start and finish date of each task as well as the dependencies with bars and vertexes, often arrows are used to make these relationships obvious.

2.6.2   Projects are temporal structures of network organisations

Traditional project collaborations are managed through the pre-defined project plan and scheduling mechanisms made by the project managers (Crawford, 2000a). But under the setting of network projects, because of the flat hierarchy power structure between the different collaboration firms, projects often start without any commonly shared interaction routines or a common social structure, and thus have a high risk of getting stuck in defensive collaboration routines (Dixon, 1993) such as lack of trust, and different ways of doing things. Therefore traditional planning- and scheduling-oriented

project management approaches are not sufficient to fully cover the structural dynamics in network projects.

> *"[…] project teams have become a popular organizational form under circumstances that require coordinated actions directed towards a non-routine goa […]" (Rickards & Moger, 2000)*

This view is consistent with several of today's project management researchers (Evaristo & van Fenema, 1999; Packendorff, 1995; Ramesh, 2002; Sarker, 2002; Shenhar, 2001; Shenhar, Tishler, Dvir, Lipovetsky, & Lechler, 2002; Söderlund, 2004) who have called for empirical studies and theory developments on these new dimensions of projects.

Projects could be seen as micro social and organisation structures of network organisations. However, because of constant changes of project team memberships across different network projects, it will require long period of time before a mature social and organisation structure emerges (Hanssen-Bauer et al., 1996). Therefore, studies on different network projects across a certain period of time can help to capture potential routinisation occuring in network organisations, but what is lacking is a theory or concept for guiding the study.

2.7. A STRUCTURATION VIEW ON NETWORK ROUTINISATION

Form social structuration theory (Giddens, 1984) perspective, routinisation could be seen as ongoing evolution of structure (existing routines) and agent (network firms) (Feldman et al., 2003). In (Pentland et al., 1994)'s study, they have pointed out that:

> *"A critical part of this conception of routines lies in the relationship between structure and agency." (Giddens, 1984).*

Similarly, (Feldman et al., 2003) have also adopted (Giddens, 1984)'s structuration theory and explain that routines are a combination of both abstract ideas of routines (structure) and a human who actually performs it at a specific time and place (Agency). However routines still reside within human interactions, are not static, and constantly evolve with the ongoing interaction of the human agency.

> *"Routines, like other social phenomena, embody a duality of structure and agency (Bourdieu, 1977, 1990; Giddens, 1984)." (Feldman et al., 2003)*

By looking into Giddens' structuration theory constructs (Figure 7), meaning, power and norms are three main social interactions that human beings create and re-create. Three "modalities" that mediate human action and social structure are interpretive schemes, resources, and norms (Giddens 1979). Interpretive schemes are standardized, shared stocks of knowledge that humans draw on to interpret behaviour and events, hence achieving meaningful interaction. Resources are the means through which intentions are realized, goals are accomplished, and power is exercised. Norms are the rules governing sanctioned or appropriate conduct. Thus, in structuration theory, these modalities are critical for determining the structure outcomes (routines) of the human actions. Therefore exploration of these modalities will help to better understand what drivers could mediate the human actions and structure (routines).

Sets of routines	**Structure**	Signification	Domination	Legitimisation
Mechanisms that enable routinisation	**Modality**	Interpretive Schemes	Facilities	Norms
Network project firms	**Human action**	Communication	Power	Sanction
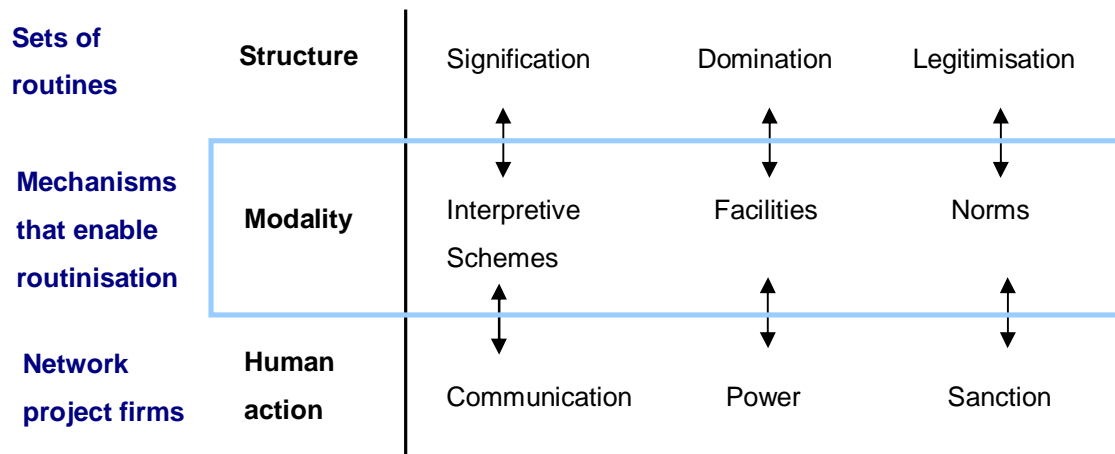
Figure 7: Structuration Framework[5]

Numerous authors have already adopted the structuration framework to explain complex social structuring process such as team development or team decision making (DeSanctis et al., 1994; Poole, Siebold, & McPhee, 1985) as an evolution of processes and structures.
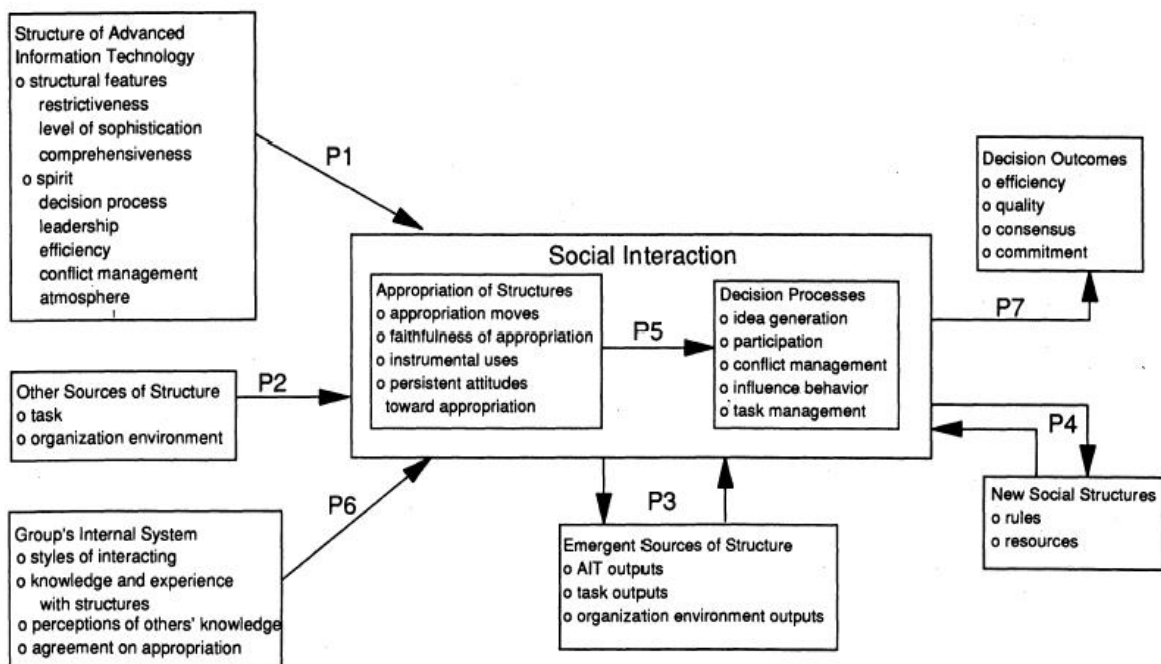
Figure 8: DeSantics and Poole's adaptive structuation theroy framework

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[5] (Giddens 1984)

In Figure 8, DesSantics and Poole have adopted (Giddens, 1991)'s structuration framework and developed a structuration understanding of group decision support system in small group change. Different structural properties and social interaction constructs have been identified.

Other authors like (Orlikowski, 1992, 2000) have focussed on explaining the structural relationship between technology, humans and organisation. Figure 9 shows Orlikowski's technology and organisation framework and contructs as an example on how (Giddens, 1984)'s structuration framework can be adopted and used for understanding of technology and organisation.
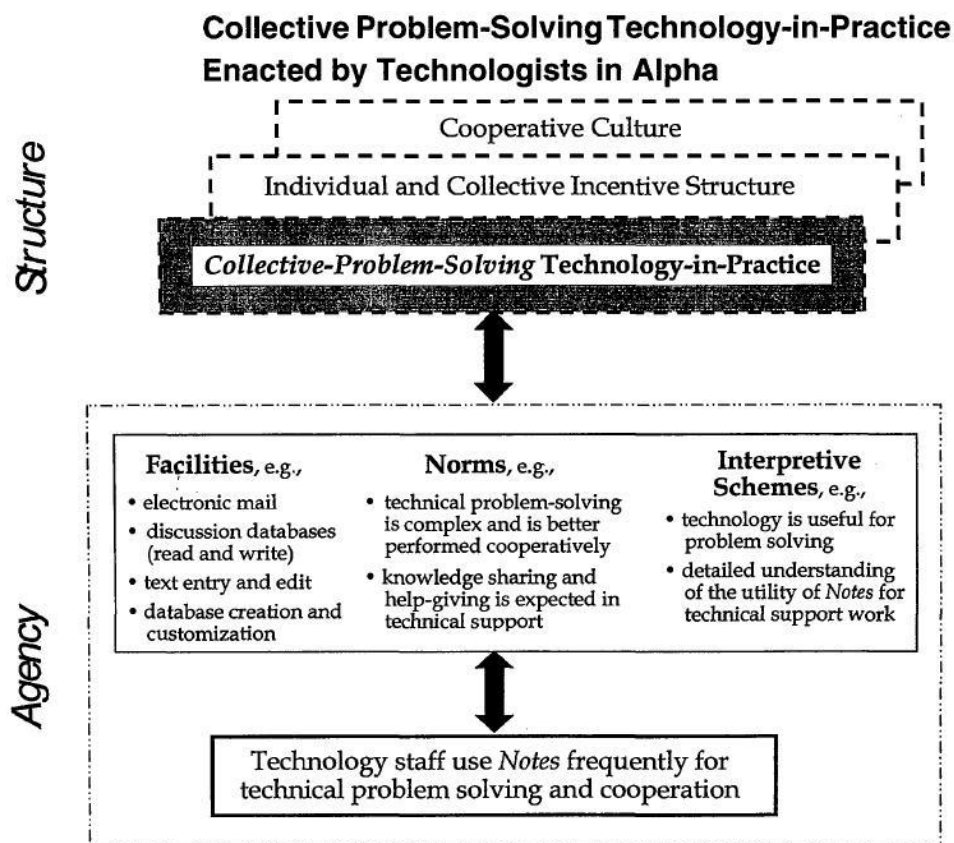
Figure 9: Orlikowski's structuration framework for studying technology in organisation

Hence structuration theory provides a good Meta theoretical framework for study routinisation in network organisations.

> *"Structuration theory offers a conceptual scheme that allows one to understand both how actors are at the same time the creators of social systems yet created by them." (Giddens, 1991)*

With this new perspective, routines can be understood as the structure and firms are the agent. The modalities are mechanisms which drive the routinisation process. This is especially critical for understanding how network organisations establish commonly shared collaborative structures. Because network projects often start without any commonly shared structures, all the collaborative structures evolve through ongoing interaction between the network partner firms. Therefore, establishing what kind agent actions or evolving modalities do exist will be crucial for understanding routinisation in network organisations.

2.7.1   Technology as a potential modality for network routinisation

Since the diffusion of technology into firms, studies on influences of technology to firms' structures have been a popular topic for many scholars (Blauner, 1964; Hage, 1974; Hage et al., 1969; Huber, 1990; Miles, 1989; Norton, 2000; Orlikowski et al., 2001; Orlikowski & Gash, 1994; Perrow, 1967; Woodward, 1965). (Hage et al., 1969) closely examined the relationship between the technology and social structure. They adopted (Perrow, 1967)'s routineness of work as the structure construct. They found that more bureaucratic or centralised firms utilised more routinised technology for regulating or coordinating behaviours to achieve the desired efficiency. Therefore, technology has played a vital role in moderating the behaviour of people in firms.

Similarly fast development of non-routine activities supporting technologies such as group decision support system, group collaboration web-platform, and many others open up a new wave of discussions on the effect of technology on firms' structures. Gidden's structuration model has been adopted by many researchers (Orlikowski, 1993; Orlikowski et al., 1994; Orlikowski, Yates, Okamura, & Fujimoto, 1995) to understand the relationship between technology, agent and firm structure (Figure 10).
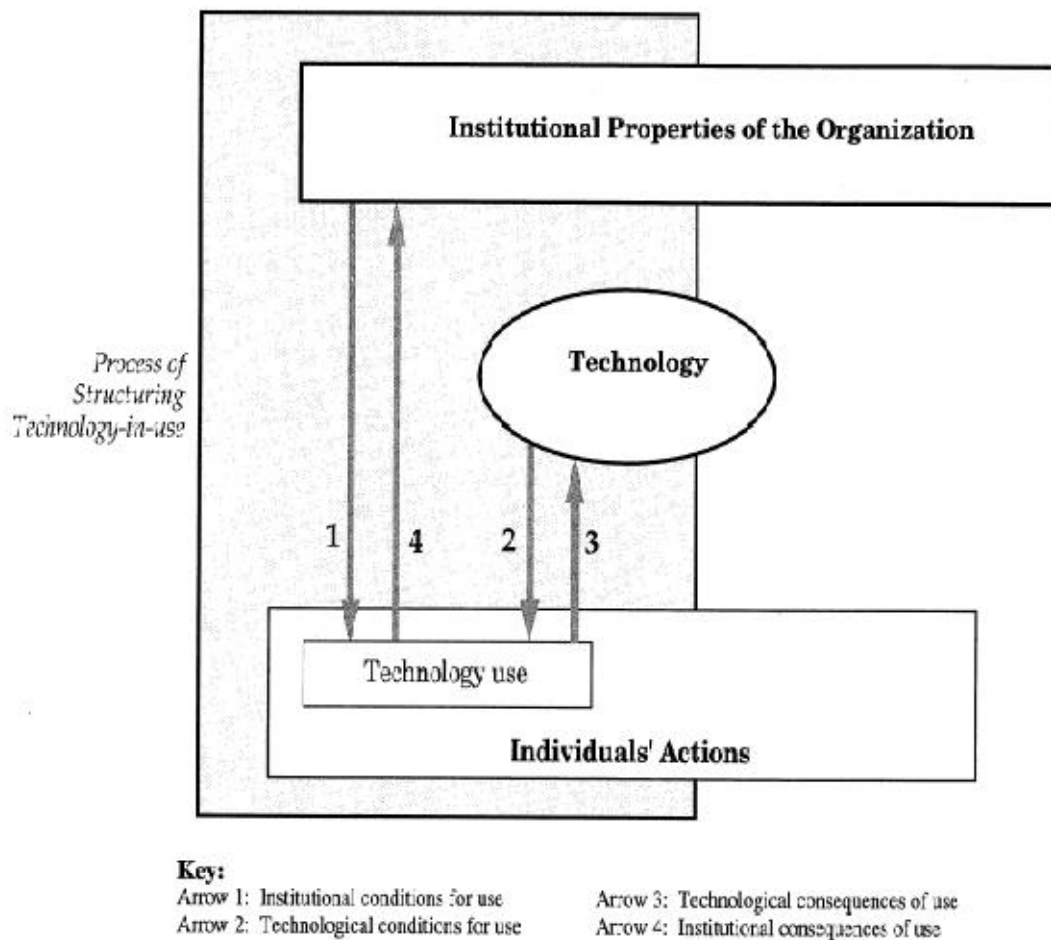
Figure 10: Process of technology structuring[6]

Through this model (Figure 10), technology can be seen as an important mediator to moderate between the agent actions and structures. Therefore, for studying routinisation

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[6] Orlikowski, W. J., Yates, J., Okamura, K., & Fujimoto, M. 1995. Shaping Electronic Communication: The Metastructuring of Technology in the Context of Use. *Organisation Science*, 6(4): 423-444.

in network organisations, technology will also be an important modality in influencing the process of routinisation.

2.8. NEW CONCEPTUAL UNDERSTANDING OF NETWORK ROUTINISATION

Routinisations in network organisations are complex social and organisational structuring processes (Giddens, 1984; Hanssen-Bauer et al., 1996; Katzy, 1998). However, when reviewing different levels (team, firm operation and firm strategy) of related analysis on routinisation, it appears that there is still a lack of a strong concept or theory to explain how routinisation could occur in network organisations, and more empirical studies are required.

2.8.1 Lack of dynamic and change dimension on routinisation from team interaction studies

From the perspective of team interactions, although traditional team dynamic theorists (Hare, 1976; LaCoursiere, 1980; McGrath, 1986; Tuckman et al., 1977) have started to address the social and structural dynamic of teams, and proposed some linear stage models, most of these conceptual models were developed based on control experiments, which some researchers have criticised as not reflecting the real firm environments of the investigated teams, and being unable to capture the change mechanisms ocurring between different stages of models (Gersick, 1988). Therefore these team dynamic models can only offer an abstract view on possible stages which teams might go through when try to routinise their interaction behaviours.

Other theories, like (McGrath, 1991)'s Time, Interaction, and Performance (TIP) theory, have critically addressed the limitations of these linear team dynamic models, but the

assumptions are still based on single firm studies. Therefore the multi-firm collaboration aspect of network organisations is not yet covered by this theory.

Apart from team dynamic theories, communication and coordination are two other theoretical approaches that relate to routinisation of team interactions. The outcomes of team communication studies have offered only a static view on routinisation. As (Hiltz et al., 1986) found, virtual team interaction tended to be more task-oriented than in face-to-face teams, hence there is not much social structuring. Similarly, existing studies on team coordination still very much assume there is a stable firm collaboration environment, while few authors have started to address the more dynamic perspective of team interactions.

2.8.2 Earlier phase theory development on routinisation in firms, but lack of network dimension

Routinisation has only recently has received limited theoretical attention from organisational behaviour and process researchers. In the past routines have always been understand as fixed standard work rules or procedures. Recently a few researchers (Cohen et al., 1994; Feldman, 2000; Gersick et al., 1990; Pentland et al., 1994) have tried to explore the change aspect of routines (Table 12).

Theoretical Perspectives	Change Arguments
Contingent	Changes to routines occur when there are crises and failures, or at the start-up phase of an organisation.
Sequential	repetitive, functionally similar pattern (subroutines)
Performative	A flow that includes the broad range of thoughts, feelings, and actions that people experience as they engage in work
Learning	A process of on going multi-actor learning ; routines emerge from the interaction of procedurally remembering individuals
Structuration	Routines, like other social phenomena, embody a duality of structure and agency
Technology structuring	Technology is playing a critical role in shaping human action and the associated social/organisational structures.

Table 12: Change perspective of routines

For example, (Feldman, 2000) has claimed that routines are connections of ideas, actions and outcomes, and the relationship between these elements enables changes. Others like (Gersick et al., 1990) have also pointed out routines are not fixed rules but repeat patterns of actions. With these news dynamic perspectives of routines, the concept of routines becomes more feasible to understand how routines could evolve under the dynamic setting of virtual project teams. (Pentland et al., 1994)'s sequential perspective of routine change has argued that routines are not only a single fixed pattern but made up of different variations of patterns. In organisation theory these different patterns are called subroutines. This provide a good explanation as to why some "traditional" non-routine processes, such as decision-making processes, do have certain repeated patterns, and (Mintzberg, 1976) has made an initial attempt to identify some of those subroutines. However, the mechanismsthat potentially drive these temporary

repeated patterns (subroutines) to change were not identified to any great extent in their study.

Despite these increasing efforts to explore where routines come from and how they change (routinisation), most of the current studies are in their early stages. On other hand, most of current studies on routinisation are still very much focussed on a single firm, rather than on network organisations. Therefore more explorative empirical studies are still required to develop a theory for better understand routinisation for both firms and network organisations.

2.8.3 Learning is an important capability for driving routinisation in firms, but depends strongly on a stable social structure

According to many organisation researchers, learning is the key mechanism that drives routinisation in firms (Eisenhardt et al., 2000; Feldman, 2000; Levitt et al., 1986; Miner, 1990; Zollo et al., 2002), and hence maintains the strategic capabilities of a firm. In (Feldman, 2000)'s study on routinisation, elements of learning (knowledge creation, adoption and exchange) are also observed in their study cases.

Nevertheless, without basic social structure, exchange of knowledge will never occur, and hence further routinisationwill not occur. This is particularly critical in network organisations, because of lack of common social structure and organisation structure between the partner firms.

Although there is substantial literature on organisational learning within firms, none of these approaches have really addressed learning in network organisations. Thus, before adopting conceptual understanding of learning for better understanding of routinisation in network organisations, more in-depth explorative studies on social structuring between network firms are required.

2.8.4   A structuration based approach for exploring routinisatoin across network projects

From literature reviews, studies on routinisation have shown its relevance from perspectives of team interactions, firm operation and firm strategy, especially with ongoing changes of firms' environments. However, most of the existing related concepts or theory developments on routinisation are still in their early phase, and limitations to applying understanding of routinisation in network organisations are also observed. One of the key limitations to apply these concepts or theories is that these concepts or theories are developed based on a single authority type of organisation setting (e.g. a firm), that has a more stable social structure, and a long history of accumulation of know-how. However in network organisations, often there is no common social network structure to start with. Therefore to better understand routinisation in network organisations, more in-depth and longitudinal studies on how network firms interact, and hence structure themselves, are required. This is directly inline with Giddens's claim that:

> *"Routine is integral both to the continuity of the personality of the agent, as he or she moves along the paths of daily activities, and to the institutions of society."(Giddens, 1984)*

In section 2.6 of this chapter, Giddens's structuration framework has been introduced, and by applying this framework we could interpret routines as outcomes of ongoing interactions between the network firms. Routinisation is the process that relates routines, mechanisms (modalities) and firms' interactions in network organisations (Figure 11).
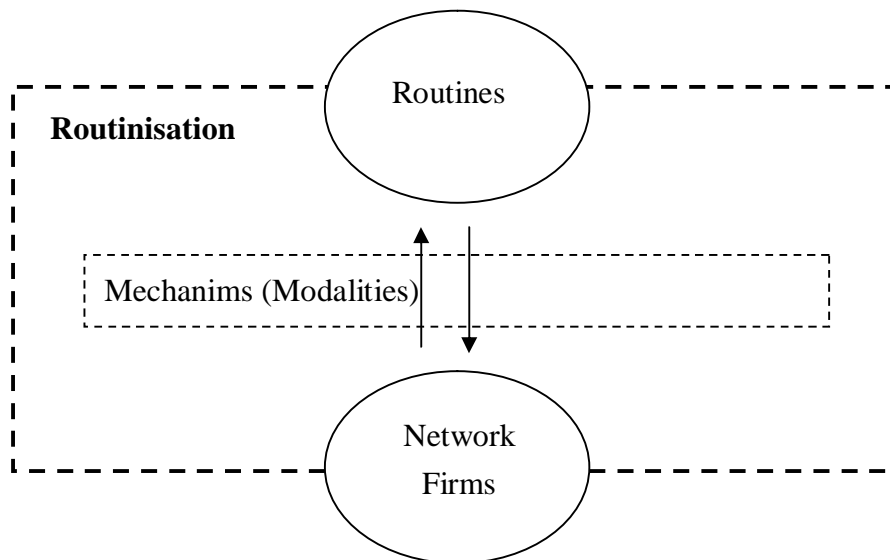
Figure 11: Structuration understanding of routinisation in network organisations

Based on the routine literature reviews in the earlier sections of this chapter, a structuration framework for studying routinisations is proposed, as shown in Figure 12. This framework has adopted the basic constructs of (Giddens, 1991)'s structuration frameworks: Structure-Modalities-Interaction (see Figure 7), but with properties of routines collected from the literature. This new framework provides a dynamic view on how routinisation could be studied in network organisations. A similar structuration analogy has also been applied by some network organisation researchers (Sydow et al., 1995, 1998) to understand the dynamic structure evolution of network organisations.

However since network organisations often begin with limited common social and organisational structures, so we would expect no common routines to exist at the beginning. Therefore, closely observing possible interpretative schemes/mechanmisms (modalities) and firms' interactions across time will help to better understand routinisations in network organisations.
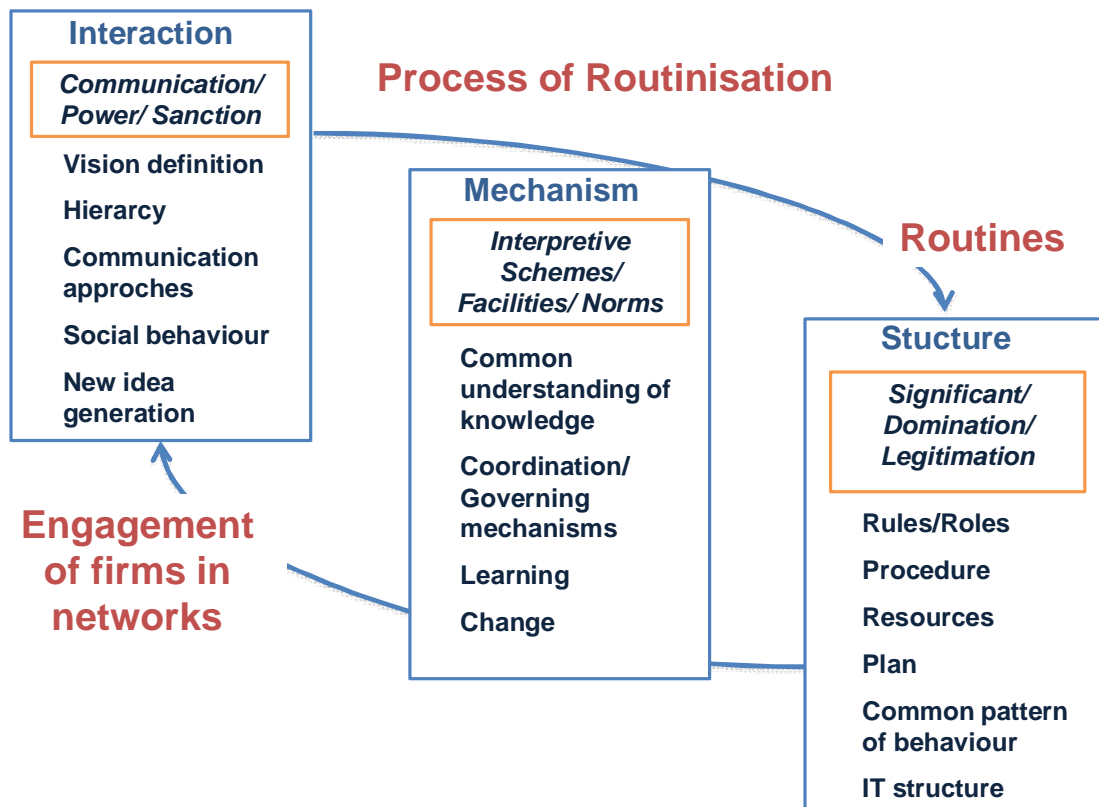
Figure 12: Framework for routinisation in networks (a structuration perspective)

As the objective of this study is to understand how routinisation could enable network organisations, I study network projects across time, because as pointed out by network project researchers like (Katzy et al., 2000; Katzy, 1998; Zigurs et al., 2001), network organisations' structures are carried within projects, and that means projects are micro-organisational structures of network organisations. Therefore, events or activities occurring across projects and times could allow possible network firms' interactions and interpretative schemes to be identified, and hence the routinisation.

In conclusion, I would expect some of the existing findings on routine changes, and organisational learning could possibly be applied in order to understand routinisation in network organisations. Nevertheless, until now, there have been very limited empirical

studies on the level of network organisations on routinisation. Therefore, this study applies a grounded theory approach (Eisenhardt, 1989), but adopts structuration framework to guide the basic research design. Further details concerning the case site selection criteria and research design will be presented in next chapter of this thesis.

3. STUDY DESIGN

3.1. LONGITUDINAL CASE STUDY METHODOLOGY

Different research methodologies can be used for studying a research question. Each methodology has different strengths and weaknesses. For example experiment is more suitable when contemporary events or activities in the research environment can be controlled, yielding better internal validity. However, since the focus of this thesis is to explore how routinisation could occur in network organisations which have no common organisation structure to start with, and because routinisation is uncontrolled and naturally occurrs in human social interactions that take place across certain time spans, I have chosen to approach this research challenge by conducting longitudinal case studies across different projects in a network of organisations. According to (Yin, 1994), case studies are particularly appropriate for answering "how" or "why" questions about current events in situations where the researcher has no control over the circumstances of the study. "Longitudinal" case studies provide the chance to capture events or activities that happened across the time span over which events and activities occurred.

In practice routines are difficult to study because they are complex social interaction processes/patterns embedded between the different actors in an interaction (Pentland et al., 1994). (Cohen et al., 1994) pointed out three key characteristics of routines which make them difficult to identify and observe:

- Routines are multi-actor: harder to observe and grasp than single-actor phenomena, and distributed character of the action further complicates the observation.

- Emergent quality (longitudinal nature): emerge through gradual multi-actor learning, and exhibit tangled histories that may frustrate both understanding and reform.

- Underlying knowledge of the parts of routines held by individual actors is often partially inarticulate.

Based on these key characteristics of routines, the studying of routines requires multi-faceted empirical data and a longitudinal type of research design. To address these challenges longitudinal case studies (Yin, 1994) allow the investigation of real-life events such as individual life cycles, organisation and managerial processes, and change, which are all critical for observing and identifying routines. According to (Yin, 1994), case studies are identified as empirical enquiries where:

- Contemporary phenomena are investigated

- The boundaries between phenomenon and context are not clearly evident

- Multi sources of evidence are use

(Feldman, 2000) used a longitudinal case study to investigate how accommodation-hiring routines evolved or changed over four years. In her case, actions of different stakeholders and activities happening across this time span were documented, as well as other artefacts which related to the hiring routines, and a routine change model was developed. Similarly, this study aims to explore how collaborative routines are established in different network organisations and across different projects. Therefore, the longitudinal data on team interactions will be captured, and from this possible drivers or mechanisms that enable routinisation in network organisations will be identified. This is the key objective of the data collection and analysis.

However, case study has been criticised as a research strategy for a number of different reasons. For instance, there can be some difficulties for the researchers in gaining access to a suitable case site, and it can be a time-consuming process, raising resource issues. Sometimes deciding on the boundaries of the study, as well as ensuring that the understanding of the current situation is comprehensive, despite a lack of knowledge regarding the history and what may follow, can be problematic. (Hussey & Hussey, 1997)

For the selected case sites most of the potential criticisms described above do not apply. First, access to the appropriate organizations has been secured since directors of a project board for each case site were the key contact persons for the rest of the project organisation, and with a good overall view on the longitudinal events and involved actors. Second, with the support of the directors of the project boards, project documents, presentations and other artefacts are also freely accessible. Also, in one particular case site the interviewer has a long history of social relationship with the organisation's directors, and interviewers have also been involved in supporting the development of the network.

Another issue concerning choice of case study methodology is lack of external validity. It is often difficult to tell how much can be generalized from any particular case study. Therefore in this study I address this concern by studying multiple case sites and comparing the findings across them. However, the goal of this study is to only explore how routinisation could occur in network organisations, and identify possible drivers or mechanisms for routinisation. Generalising the results is not the key focus, and hence I would not suggest that the results can be applied to all the network organisations.

3.2. ROUTINE IDENTIFICATION IN A VIRTUAL PROJECT

As the research focus is to explore how routinisationtake place under the setting of network organisations, it is critical to first identify potential routine-oriented behaviours or processes between the network project firms. By definition, routines could exist in different forms. They could be as visible as written rules and guidelines, or potentially hidden within the interaction gestures between the team members. To approach these different forms of routines, I have used (Cohen et al., 1994)'s three critical challenges (multi actors, emergent quality- longitudinal, distributed and hidden in different stakeholders) to identify routines and propose the following steps (multiple sources) to capture possible existence of routines.

- **Identify global generic operation processes**

    Project teams are often assembled to complete a certain business objective, and for each different business sector there are certain generic business processes which the projects are based on. For example, a typical product development project often has to go through requirement, design, build and testing processes. Therefore first identifying these global generic business processes will help to further explore and narrow down the micro-level processes, and hence provide the basic study boundary for observing or recognising possible routinisation activities.

- **Identify key stakeholders for the potential routines**

    Routines can only be called when several actors are constantly interacting toward certain repeated pattern of behaviours or processes. Therefore, a completed view of a routine can only be revealed when each associated actor's behaviours are captured (Cohen et al., 1994). In this study, I approach this by first interviewing

directors of the project board, and cross checking with archive data such as project plans, task stakeholder lists, meeting minutes, and possibly exchange of e-mails.

- **Longitudinal archive data analysis**

Often decisions and consensuses are made during project milestone meetings, and also learning is accumulated and new recommendations are made. Therefore, closely examining longitudinal archive data, such as interim project reports, meeting minutes, and events calendars, will help to trace if there are changes occur to overall interaction behaviours or processes.

- **Stakeholder interview**

As routines could remain within different stakeholders' minds, another key challenge is how to extract these different partial memories of the different stakeholders. To approach this challenge, in this study, I conducted interviews with a majority of the stakeholders who have participated in different projects at different points of time. For the selected network organisation cases, two to three projects across six to ten years were studied. To further ensure the correct choice of the interviewees, prior the full scale interviews with all the stakeholders, explorative interviews with the directors of the project boards were carried out, to get a first hand understanding of the different stakeholders.

- **Collaboration IT platforms**

Because most of the network projects are carried out across different distributed locations, IT technologies are commonly used to facilitate the communication and coordination of the project works. Therefore studying the usage of different collaboration technologies can also help to identify possible repeated patterns of

behaviours. Apart from examining collaboration technologies, study of exchanged e-mails (if permitted) will also provide very rich information on possible routine behaviours, asmore than 70% of the virtual project team communication and exchange of information are through e-mails. Nevertheless, confidentiality issues have made it difficult to obtain e-mail communications from project stakeholders.

- **On-site observation**

On-site observation provides rich social behaviours of the different project stakeholders and the project team as a whole. However, similarly to e-mails, confidential issues often pose constraints in carrying out on site observation.

- **Triangulation of collected data**

Finally correlating the data collected from above sources and steps will help to enhance the validity of the results. In Table 13 a summary of different steps carried out in different study sites is provided.

Routine Identification Steps	Global Processes	Identify stakeholder	Archive data	Interview	Collaboration IT	On-site observation
Case Sites						
ESoCE-NET / ICE	×	×	×	×	×	×
ARC TIME	×	×	×	×	limited	limited
WASLA-HALE	×	×	×	×	limited	limited

Table 13: Routine identification steps and date access status

3.3. CASE SITE SELECTION

In this section, criteria for choosing research sites in which to study routinisation in network organisations will be discussed. A brief introduction to the case sites will also be given.

Overall three case sites have been chosen. There were two main reasons why only three sites were selected for this study. First, this study aims to explore how routinisation could occur in network organisations. The study is not an attempt to prove or disprove certain hypotheses which would require a much larger sample of data to draw significant statistical conclusions. Second, routinisation often takes a relatively long period of time to emerge. Therefore it is relatively difficult to obtain sufficient longitudinal data. Third, to identify certain routine behaviours requires multiple data sources (as described in 4.2); therefore the amount of accessible data has also play a vital role in deciding the case site.

In this study, I have applied several criteria for selection of the case sites:

- **Access to multiple projects in network organisations**

There are already few studies being done on routinisation in single firms, but there is no study so far on network organisations. In network organisations, projects are a common way to organise work. Therefore all the selected case sites do allow access to longitudinal data across different network projects.

- **Within same domain, but different focus**

In order to provide a variety of networks, different natures of collaborations have been chosen in different cases. The first case is about voluntary joint network building and service offering, the second on joint service offering and the third concerns product development. Nevertheless, the common ground for all three

case sites is that all are about "engineering" networks and operate on a project basis.

Case	Collaboration natures
ESoCE-NET / ICE	Voluntary network building and service offering
ARC TIME	Joint service offering
WASLA-HALE	Joint product development

Table 14: Collaboration nature of the study cases

- **Geographically distributed network in participating firms across a project**

Another case selection criterion for the case site is geographic distribution of participating firms within the network working on a project. Since routinisation in co-located, project settings are already addressed by earlier literatures, but less has been written on distributed network projects. Therefore, to distinguish from existing studies, networks with distributed firms participating in projects were selected.

- **IT Support communication**

Under the criterion that participating firms within a project are distributed, project collaborations are often mediated through different types of IT collaboration technologies. Therefore access to team's collaboration technologies is also one of the case site selection criteria. In one of the cases full access to all the IT collaboration technologies is available, while in the other two cases, restricted access rights were granted.

- **Cover full lifespan of routinisation**

Routinisation is a complex social interaction and a time dependent process. Therefore, in order to capture the full lifespan of certain routinisation process, access to longitudinal data is essential. In all three cases adequate access to longitudinal archive data was fully available, especially in the ESoCE-NET and ARC cases. Observations and interviews were also carried out to ensure the validity of the data.

- **Adequate access to most of the project team members**

As discussed in section 4.3, most of key stakeholders of identified routines for all three cases were available for interview.

3.4. BRIEF SUMMARY TO CASE BACKGROUND

3.4.1 CASE A: ESoCE-NET – building a network on concurrent enterprising

ESoCE-NET is a network of professional engineers who are specialised in the area

concurrent enterprising. The network was set up in early 1990, and has organised more than 12 international conferences to date, across different countries in Europe, with an average of 220-250 attendees per annual

conference, from both academia and industry.

The network is represented by 6 core-organising committee members, who come from 5 different European countries, and represent 6 different firms. Apart from these 6 core-organising members, there are further 40-50 voluntary support people. Every year the conference is organised as a project. A conference steering committee, which mainly

consists of the core organising members and a local organising leader, will be elected. After each conference, the local organising team dissolves and a new one is established.

3.4.2   CASE B: ARC IP – building an interoperable roadside assistance system

A yellow patrol van is the first association with a European Automobile club in most

countries. They offer assistance services to their members whenever a car or its passengers are in difficulties. For almost as long as cars have existed, automobile clubs have provided roadside assistance in nearly every European country. Roadside assistance has become an industry of its own, with a market size of approximately 142 million people under the roadside assistance service across Europe.

However the early 1990s heralded a radical change in the industry when motor manufacturers entered the market in an attempt to retain a relationship with their customers throughout the lifecycle of the car. In 1991 eight major European automobile clubs, AA (United Kingdom), ACI (Italy), ADAC (Germany), ANWB (Netherlands), ÖAMTC (Austria), RACE (Spain), TCB (Belgium), and TCS (Switzerland), created ARC Transistance to offer roadside assistance services to the car industry on a pan-European basis.

As ARC Transistance CEO's vision to create a pan-European roadside-assistance network, several collaboration projects were initiated. An ARC interoperability project, with the aim of building a common interoperable system for all the member clubs, is one of the critical collaboration activities. The project consists of two phases. The first

phase started in December 1996 with the aim of building a prototype, which was implemented in a joint operation centre in May 1999. A second phase then followed, completed in April 2002, with the objective of developing a more open architecture for flexible customisation and adoption.

In terms of project organisation, a project board consisted of senior operational and technical representatives from different stakeholder clubs. Under the project board, an operational project team were assembled to carry out the project activities. Overall there were more than 50 people directly or indirectly participated within the two phases of the project.

3.4.3   CASE C: WASLA-HALE - building an unmanned aeroplane

The WASLA-HALE project stands for "Weitreichende abstandsfähige signalerfassende

luft-gestütze Aufklärung - High Altitude Long Endurance". It is a German initiative research programme to demonstrate techniques and procedures on how to guide a UAV (uninhabited air vehicle) in controlled airspace. Typical requirements include flying under IFR (Instrument Flight Rules) with sense-and-avoid manoeuvres. Overall the project consists of three phases. The first phase started in September 2000, with specific focus on the requirement specification, and the second phase, which ended in Sep 2004, developed a demonstration prototype. The third phase aims to demonstrate these capabilities in a flight test with DLR's experimental aircraft ATTAS (Advanced Technology and Testing Aircraft System), and is expected to be completed in June 2008. The results of this research programme will

be implemented in future acquisitions of UAVs by the Federal Armed Forces of Germany for air reconnaissance purposes.

In terms of the overall project organisational setting, there are five major German aeronautic organisations that have long history of collaboration with each other on some other projects. In the WASLA-HALE project there are total of 12 to 16 project team members who work closely with each other, and each organisation has assigned a point-of-contact person to represent the company and a further three to four assistant workers. In general the numbers of project team members varies over time, analogical to the project phase and man-power needs.

3.5. DATA COLLECTION

There are three major types of data which have been collected during the study:

- Interview data

- Observational data

- Archive records and documents

3.5.1 Interview data

Most of the information concerning routinisation is collected through semi-structuredinterviews with various stakeholders, regarding the routines from different organisations. As (March et al., 1958) point out:

> *"Most programs are stored in the minds of the employees who carry them out, or in the minds of their superiors, subordinates or associates. For many purposes, the simplest and most accurate way to discover what a person does is to ask him."*

This argument directly reflects (Cohen et al., 1994)'s claim that routines are the outcome of multi-actor interactions and are stored within the minds of these different actors.

Case Sites	Date	Population	Numbr of semi-structured interviews
ESoCE-NET/ICE	Oct 2001– March 2007	Organisation director	2
		Organisation manager	2
		Research institute director/ professor	5
ARC	Aug 2001 – June 2002	Project manager	3
		Chief information officer	2
		Chief operation officer	7
		Senior manager	5
		CEO	1
		Vice president	1
WASLA-HALE	Sep 2005 – Aug 2006	Project manager	7
		Member of project board	1

Table 15: Semi-structured interviews

Table 15 provides a quick overview on numbers of interviews carried out per case site. Each interview typically took one or one-and-a-half hours. The typical questions the interviewees were asked were: (1) What kind of role do you have in the project; (2) what are your typical daily activities in the project; (3) what are the typical steps to carry out these activities; (4) how do you normally interact and coordinate work with your project colleagues; (5) for how long were you involved in the project; (6) are there any guidelines for regulating team interactions? Based on these basic explorative questions, the details of events occuring and people whom they constantly communicated with were discussed further. For example, some interviewees were asked to describe how they shared the project documents with their peers.

3.5.2   Observational data

As discussed earlier, in section 3.2 observations can help to capture additional information which the interviewees might not be able to remember accurately, such as when certain events or activities occurred or were carried out. For example, in one of the case sites I was able to sit within most of the strategic decision-making meetings, as well as participate in certain activities. With the other two sites a half-day visit with some of the interviewees was also allowed.

3.5.3   Archive records, artefacts and documents

Source of Data	Example
Documentation	• Internet publications • Marketing flyers • Press releases • Meeting agenda • Internal memoranda
Archival records	• List of meeting attendees • List of project members across different time spans • Periodic progress reports • Meeting minutes • Exchange of e-mails • Milestone reports
Physical Artifacts	• Public website • Collaboration platform / system • Communication system • Product or service offering descriptions • Workflow system

Table 16: Triangulation of different data sources

Apart from interview and observation, several different types of hard copy data were also collected. Table 16 provides quick overview of different types of hard copy data

which were collected in the three different case sites and used for triangulation of the results.

3.6. DATA ANALYSIS

To analyse interview transcripts notes and archive data, I applied a qualitative inductive analysis technique. The process began by examining all interview transcripts, notes and archive data to establish the history of the network and of the collaboration activities within different projects. Based on this initial examination, the interview transcripts and notes were coded to identify text segments referring to certain steps of a collaboration activity between the project members. These segments were then assigned to theoretically meaningful categories derived initially from the literature (e.g., comment patterns of behaviour, routine change, common rules, routine learning) - the framework for routinisation in networks (Figure 12). As described in section 4.2, several steps for identifying possible routine behaviours were used in the study. Nevertheless these categories also evolved through the course of the data analysis to fit any existing codes, or requirements to define new codes or modify existing codes. This iterative cycle continued until each identified segment fit cleanly within some category. For the final validation of the findings, case reports were sent to the case sites.

In terms of internal validity of the findings, Yin has argued that internal validity does not apply to exploratory research, as such studies do not making any causal relationships. In this study multi-cases were used to provide different perspectives from the different background settings of the project teams.

4. CASE STUDIES

4.1. CASE A: ESoCE-NET- Building a European Network on Concurrent Enterprising

4.1.1   Case background – How did things get started?

The ESoCE-NET, European Society of Concurrent Enterprising [7] Network, is a non-profit association bringing together academics, researchers and industry practitioners to stimulate the exchange of ideas, views, practices and latest research and developments in the field of Concurrent Enterprising. The network was founded in 1991 by four of the core network organising members, and collaboration was the way to achieve this vision.

> *"At the 1991 Concurrent Engineering conference in the US, we started to discuss how to create something in Europe, working together rather than individually. We were meeting from time to time in the US, so we thought let's do something together; that is why we created ESoCE-NET." (Marc Pallot, Co-Founder of ESoCE-NET, ICE 94, 95,07 local organising, France)*

Conference organising was one of the most critical steps in operationalising the vision set by the founders of ESoCE-NET. To date more than 13 conferences have been

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[7] Concurrent Enterprising is the co-operation among companies, possibly geographically dispersed, harmonising their processes and involving customers and suppliers in the design and manufacturing of products and services.

organised in 9 different European countries, and the next conference will be organised in Sophia Antipolis, which was the root of the International Conference on Current Enterprising - ICE (Figure 13).

- 1994:		Sophia Antipolis	- 2001:		Bremen	
- 1995:		Stockholm	- 2002:		Rome	
- 1996:		Milan	- 2003:		Helsinki	
- 1997:		Nottingham	- 2004:		Sevilla	
- 1998:		Sinaia	- 2005:		Munich	
- 1999:		The Hague	- 2006:		Milano	
- 2000:		Toulouse	- 2007:		Sophia Antipolis	

Figure 13: ICE Conferences over 14 years

In 1994, the first concurrent enterprising workshop-based conference was organised in Sophia Antipolis, France, and then followed by a second one in Stockholm, Sweden, in 1995. On average 50-60 invited expert participants attended the workshops. The overall organisation of the first workshop was mainly done by a single organiser, while during the second workshop in Stockholm two additional local partners provided the local logistic support. There are still no clearly defined processes for collaborative organisation of the workshops.

In 1996, a two day semi-academic and semi-commercial conference was organised in Milan, Italy. The speakers were invited; no formal paper reviewing process was introduced. This was a very successfully organised conference with approximately 120 attendees. In terms of organising the conference, one conference champion was in charge of the overall organising of the conference, with support from the previous conference organisers. This collaboration structure has been adopted as the basis for later conferences, where every year one new champion is identified and takes charge of the coordination of the conference organising team.

Between the 1996 and 1997 conferences, European public founding (CE-NET I project) was granted to support the formal organisation of the conference. During the preparation of the ICE 97 conference in Nottingham, UK, several key collaboration activities were introduced. For example the first call for papers, first printed conference proceedings, first paper review process, and first formal organising committee were introduced and established during the preparation phase of the conference. Nevertheless, part of the conference was driven by the requests of European commission for EU project review and result dissemination.

> *"Before 97 it was semi commercial, they tried to attract more practitioners but not too many academics, because the workshops in 94 and 95 were simply presentations […] during the 97 conference, for the very first time, a call for papers was introduced, but the conference still relied quite a lot on EU projects. The call was support by the EU, which sent e-mail information to all the EU projects to encourage them to participate in the events." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)*

After the 1997 conference, a multi-national conference-organising committee was established, but at the same time the financial incentive from the European commission expired.

> *"After conference 1997, they were thinking of organiinge another one, but in CE-NET I we only had to organise one conference. So it was a bit in flux, whether to organise one or not. Marc, who was coordinator of CE-NET, had a contact form Romania, so we went to Romania in 98. The*

conference is a semi conference of one or one-and-a-half days, and A4 bound proceedings were produced, with 70-80 people attending; a good event and good people." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)

Although the conference in Romania was successfully organised, it was not a full conference as was the one in Nottingham. There was no official call for papers, paper review process or formally printed proceedings, and it was only one-and-a-half day event. Nevertheless, this was the first time in which an external champion (non co-founders of ESoCE-NET) took on more responsibility for organising the conference.

In 1999, it was a big challenge for the core team to find a strongly committed champion to take responsibility for organising the conference in Den Hague, The Netherlands.

"We wanted to organise another conference, to but we couldn't find a home and a person who could do it. Then Signal said they wanted to organise it, but the commitment was only partial. We spent a lot time on a visit to Signal, but in the end they pulled out. They couldn't do it. Then Klaus-Dieter and I went to see Neil Wagmen at University Twente, and convinced her to take a lead in it. Then we decided to go to Den Huage." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)

Nevertheless, it wasn't a smooth two-day conference; for example problems occurred in paper submission process.

> *"It was very tough; we had a lot of difficulties. We had paper submissions; Klaus-Dieter handled the paper submission process. However authors sent papers via e-mails and some got lost. At the end, it was a very difficult conference." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)*

Despite these drawbacks, for the very first time cooperate identity was produced – the ICE conference logo. After the difficult conference in 99, the overall strategy of the 2000 ICE conference in Toulouse, France was started in a totally new dimension.

> *"I was in charge in organising the ICE conference in Toulouse. This was a starting point of new generation of ICE conference. The ICE conference 99 […] it was not successful, in terms of satisfaction. So ICE 2000 was almost started from scratch, to give a new dimension to the conference, and there we defined a format which has been applied almost every year." (Olivier Roelle, ICE 2000 Local Organiser, ADEPA, France)*

A new three-day conference structure was introduced, with day one having three academic tracks, day two, four parallel workshops, with specific focus on the public founding projects – EU projects, and day three as an evolutional i.e. new innovative ideas or topics year by year. Apart from the new structure of the conference, a conference data base with a participant contact list defined from past events was also produced. Overall the conference was a success, and more than 200 people attended.

After the 2000 conference, the role of the organising committee has become more transparent, and the local organisers of the yearly conference were invited to become a member of the organising committee.

Figure 14: ICE organising committees over the years

During the 2001 conference in Bremen, Germany, several new improvements to the overall conference operation were introduced. For example a new corporate design of the conference web-site was introduced, and the paper reviewing process was also formalised, with a paper template and author guidelines. Other items, like conference flyers, were also redesigned. With these basic organisational structures and revised paper submission processes, the ICE conference continues to develop and evolve. Figure 15 provides a quick overall view on numbers of attendees over 13 years (1994 - 2006).

Despite the steady development of the remaining conferences, there were also some pitfalls and new innovative ideas. For example during the 2002 conference in Helsinki, Finland, initial lack of a strong committee from the local organisers forced the organising committee to become directly involved for the early phase of the conference organising. Nevertheless, soon after a new local organising champion was identified and the organising was back in track.
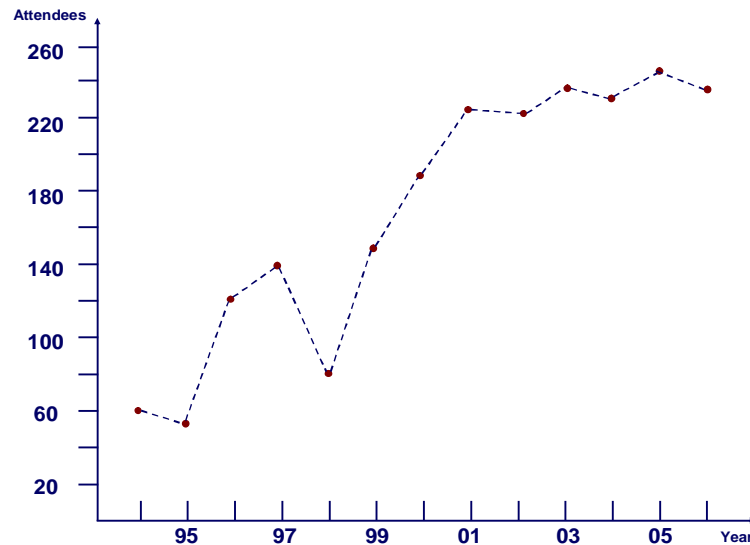
Figure 15: ICE Conference attendees

In 2004, a new conference paper reviewing workflow system was introduced to facilitate the organising of the paper review process. Various similar information communication systems were also introduced at various time points to enhance the communication between the distributed annual conference organising team. To date more than 90% of the conference-organising-related decision making and meetings were carried out through virtual conference meetings.

4.1.2   Routinisation through annual conference organising

Since establishment of the ICE conference in 1994, the organising of the conferences has been constantly evolving, with routines being introduced throughout the period. These routines range from operation-oriented information and activities-coordination routines to strategic decision-making routines. These routines evolve and change throughout the time period, with new organising members participating each year and making contributions.

4.1.2.1. Innovation drives ongoing development of conference organising team

Organisation of the ICE conferences was started by few core people who had the ambition to establish a European network of experts to work together and exchange understanding on concurrent enterprising. After the first three years accumulating experience of conference organising, and trials in France, Sweden and Italy, in 1997 for the first time a conference organising committee was established (Figure 16). The organising committee took the responsibility to make decisions and transfer know-how to the annual conference organisers. The relationship between the team members is mainly peer-based, with complementary skills.

> *"Everybody shared some responsibility to some degree. Everybody did those things which he could do the best, and that was probably the best thing in the conference. For instance Roberto […] he encouraged people, I took care of the small organisational issues, Kulwant also brought together […] so everybody had his role" (Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)*

Since the 2000 conference, each year's conference champion was invited to become a permanent member of the overall conference organising committee. Nevertheless, the decision to contribute is very much up to each individual.
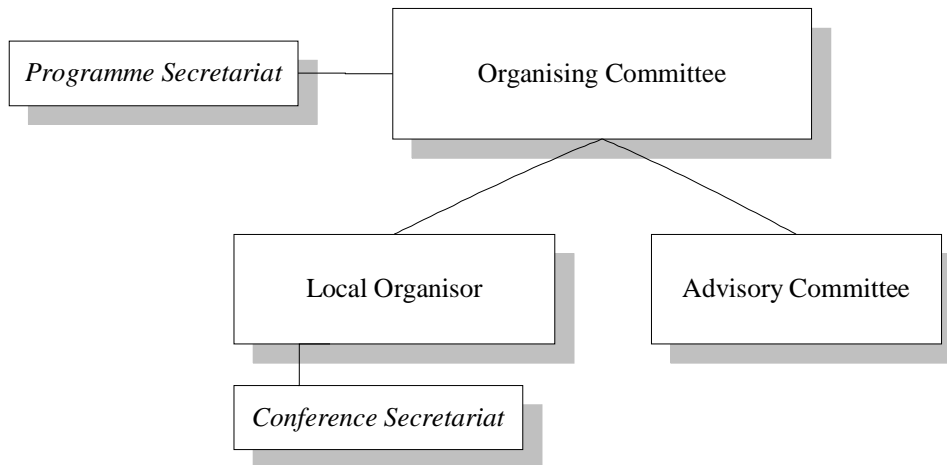
Figure 16: ICE Conference management structure[8]

Although there is a predefined conference management structure, most of the new committee team members had no clear assignments or responsibilities. Therefore, during the review meeting after conference 2005 in Munich, only the active ones are remained within the conference organising committee.

> *"In Munich the committee was getting bigger and bigger, but the problem was that the committee members were not paying any fees. So we have re-organised the committee, so at least if people are attending they make contributions." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)*

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[8] Adopted from the ICE Conference Management Handbook 2003-08-25
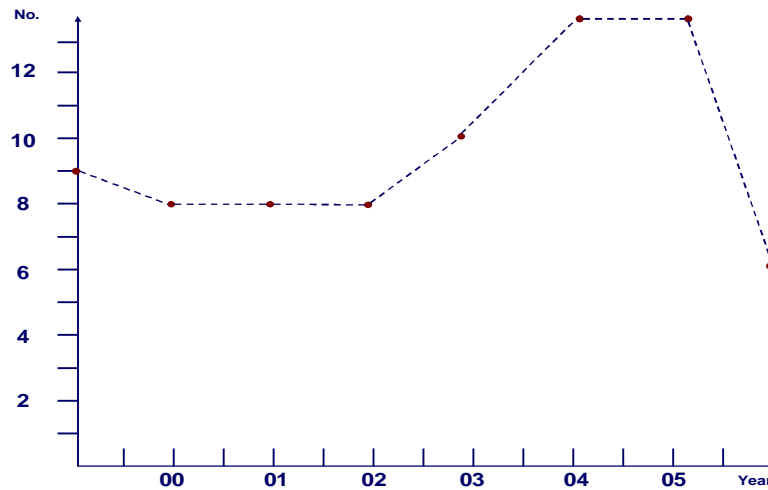
Figure 17: Organising committees over the years

During the organising committee meeting in Munich, prior to the start of the conference,a few potential roles of the organising committee were discussed.
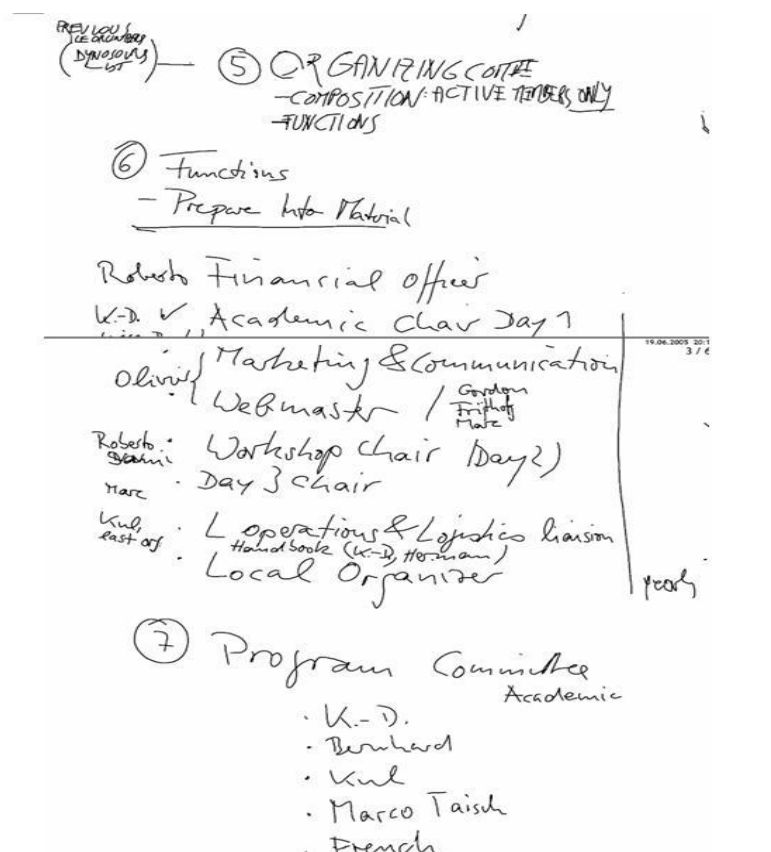
Figure 18: Discussion on concrete roles within the organising committee[9]

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[9] Source from ICE 2005 Organising committee meeting minutes in Munich 19.06.2005

However, these only began to be implemented at the 2007 conference, where clear role assignments were given to the organising committee members. (Figure 19)

Organising Committee

Executive Committee

Conference chair:
Marc Pallot,
ESoCE-Net, France

Co-chairs:
Marco Taisch,
Politecnico di Milano, Italy

Ricardo Goncalves,
UNINOVA, Portugal

Marketing & Communication

Olivier Rérolle,
CETIM, The Netherlands

Sponsoring

Servane Crave,
France Telecom Orange, France

Website

Gordon Sung,
CETIM, Germany
Peter Antoniac,
University of Oulu, Finland
Kjetil Kristensen,
ESoCE-NET, Norway

Proceedings

Johann Riedel,
University of Nottingham, UK

ICE Newsletter

Carmen Aguilera,
ISOIN, Spain
Abdul Samad (Sami) Kazi,
VTT, Finland

Academic Committee

Chair:
Klaus-Dieter Thoben,
BIBA, Germany
Bernhard Katzy,
CeTIM, Germany
Kulwant S Pawar,
University of Nottingham, UK
Simon Richir,
ENSAM, France

Workshop Committee

Chair:
Roberto Santoro,
ESoCE-Net, Italy
Hermann Loeh,
CeTIM, Germany
Marco Conte,
ESoCE-Net, Italy
Sergio Terzi,
University of Bergamo, Italy
Jürgen Vogel,
Gründerregion-M, Munich, Germany

ICE'2007 Local Organising Committee

Chair:
Marc Pallot,
ESoCE-NET, France
Servane Crave,
France Telecom Orange, France
Olivier Rérolle,
CeTIM, The Netherlands
Alain Zarli,
CSTB, France

Figure 19: ICE 2007 Conference organising committee[10]

Nevertheless, innovations from each year's conference organising team have been of considerable value to the future organising of the conferences. Table 17 provides a quick summary of key innovative ideas brought in by each year's conference organising team.

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[10] Source from ICE 2007 Conference website www.ice-conference.org

Year	New idea introduced
1994	• First European conference on concurrent engineering
1995	• First local logistic supporting team • First after-conference dinner social event
1996	• First guided tour of CE • First industrial exhibition stands
1997	• First call for papers (first academic oriented conference) • First printed proceedings • First conference organising committee team • First paper review process
1998	• N.A.
1999	• First logo of ICE conference
2000	• First ICE conference distribution list • First three days conference programme • First industry visit • First time workshop on topic, and not project • First telephone conference meeting • First industrial sponsorship
2001	• First corporate design (website) • First draft of the conference organising handbook • First Organisational. committee meeting logbook • First instructions or templates for paper writing, and paper review guidelines • First detailed modelling of paper review process
2002	• N.A
2003	• First conference day programme handbook
2004	• First paper submission workflow system
2005	• First conference on-line proceedings
2005	• First time stop sending call for paper by post

Table 17: Innovative ideas introduced during different years' conferences

Most of these new ideas that were introduced during different years' conferences were later evolved and adopted as part of later annual conference organising routines.

4.1.2.2. Selecting the right annual conference champion and team

One of the most critical management and strategic routines of the organising committee is to identify an upcoming year's conference local organising champion. The jointly identified champion usually takes full responsibility for the daily coordination and communication of the local conference preparation between the annual organising team members and his or her local team.

> *"So having a champion to sit in the driving seat is very important. Traditionally we think it is important to look for a local person to be the champion." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)*

During the early phase of the conference, the co-founders of ESoCE-Net took over the role of organising the conferences, on some occasions with logistic support from some local volunteers. After the 1997 conference, several possible selection criteria for external members were very much established, mainly based on personal contact and expressions of interest, but sometimes on to avert a crisis.

> *"Also at that time there was interest from someone in Romania whocame to Nottingham in '97. He wanted to create a Romanian association. And he wanted to organise a CE-NET meeting and event in Romania in 98."*
>
> *"In 1998, we spent a lot time visiting Signal, but in the end they pulled out. So they couldn't do it. Then Klaus-Dieter and I went to see Neil Wagmen at University Twente, and convinced her to take a lead in it." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee*

chair 1997-2004, ICE 1997 local organiser, University of Nottingham,

UK)

Nevertheless, high risk still remained when the initially committed conference organisers did not take up the intended responsibility. Therefore, during the conference organising strategic meeting prior to the start of the 2005 conference, Brainstorming on possible candidates for the next four to five years of conferences (Figure 20) took place, to allow more time for communication and coaching with the identified local conference organising champions.

Figure 20: Brainstorming on future local organising champions[11]

4.1.2.3. Learning how to collaboratively organise and transfer know-how

As the idea is to have each year's conference organised by different local conference organising champions, the efforts to coordinate collaborative working and assign responsibilities are significant. During the earlier conferences (940-96), the main objective was to create awareness and publicity on the topic of Concurrent Enterprising

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[11] Source from ICE 2005 Organising committee meeting minutes in Munich 23.02.2005

(CE). Therefore the focus was very much to bring in different people from academia, industry and the European commission and to establish a community around the topic of CE. So the concepts of what a conference should look like and how an organising committee is structured were not so clear and fixed at that stage. Thus, individuals' interests and idea contributions were the main mechanisms behind the organising of these earlier conferences.

In 1997, for the first time, a conference organising committee was created, and the idea to have a more academic element within the conference was also brought in. In addition a few collaborative working processes such as paper review, a conference website, and conference proceedings were also introduced.

> *"Because of the academic and semi-academic conference, papers were reviewed by different people; it was not as standard as now, but they were reviewed. And by first time it was printed proceedings [...] Frithjof got quite involved in the proceedings [...] Frithjof was the WP leader in the conference website." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)*

Due to the lack of resources and clear committed responsibility to the overall organising from the organising committee, the conference in 1998 once again fell back to a semi-conference with invited guests and presentations but without clearly defined collaborative efforts among the organising committee. In 1999, although initially a local organising champion was identified to take full responsibility for the conference organising, but half way the person was withdrawn. Later a new local organising champion was identified. The issue of establishing shared responsibilities between the

organising committee and the local organiser to minimise the risk was raised after the conference.

> *"The idea of clearly assigned responsibilities came out in the Huage, as we learnt it doesn't work if someone is taking on all the risks; we need to share the work." (Klaus-Dieter Thoben, Co-Founder of ESoCE-NET, ICE 2001 local organiser, BIBA, University of Bremen, Germany)*

After the unsatisfactory conference in 1999, the organising of the ICE 2000 conference was almost started from scratch, with a new full three-day conference programme (Day 1 – academic, Day 2 – workshop, Day 3 – evaluative format), and the role of the organising committee became visible and shows strong collaborative efforts.

> *"It has been a breakthrough. It has been based on the difficulties in starting from scratch, including the database for the contact list, which had to be re-initiated to constitute the entire event database. It has been a real collaborative work with the organising committee […] It was Frithjof, Kulwant, Klaus-Dieter for call for papers, paper review, and proceedings. Roberto Marc and I for the workshop organising and EADS for sponsoring. Basically there is a strong input from the organising committee in ICE 2000." (Olivier Roelle, ICE 2000 Local Organiser, ADEPA, France)*

The 2000 conference was a good start for collaboration between the members of the organising committee, and clearlyassigned responsibilities and roles were given. Transfer of know-how between the organising committee and local organiser had also been established.

"The programme has always being collectively built in the organising committee session. We always discuss in the committee meeting what we are going to do in the first, second and third day, and after some time, it was almost first and second days are always looking very similar, but the third day always looks different, and what is going to be different is always discussed in committee." (Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)

Nevertheless there was still a significant amount of conference organising know-how very much remaining within each different individual's memory, within the organising committee. After the conference in 2001, one of the local organising champions had tried to start drafting a handbook to capture all this conference organising know-how, which covered the following aspects.

- Conference Organising management
- Production of papers and contributions
- Brochures & Posters
- Proceedings
- ICE conference website
- Local conference Organising
- PR / Advertising

- Costs
- ICE time schedule
- ICE information infrastructure
- The ICE document template
- Conflict resolution
- ICE contact list

"[…] After some time we also started to write a handbook on how to run these processes , because it turns out it needs quite a lot of knowledge to do these […]"(Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)

Despite this initiative to formalise the conference organising, some of the conference organising committee members thought it might be too difficult to fully formalise, and that it was important to allow some flexibility for new ideas or changes.

"There are some experiences to transfer. I still have the draft of the handbook. We also tried to bring things together […] there are always some changes, the processes were not stable." (Klaus-Dieter Thoben, Co-Founder of ESoCE-NET, ICE 2001 local organiser, BIBA, University of Bremen, Germany)

"It is nice to have clear devoted processes, but it is not something too stable in this environment, because things change so rapidly; it is not a traditional academic conference [...] Here we are trying to be academic, industry and EU. It is hybrid; this is why sometimes it is chaos." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)

"We were not so good at formalising things. Maybe from a certain point of view that is also our strength – flexibility" (Roberto Santoro, President of ESoCE-NET, ICE 96, 02 local organiser, Italy)

On the other hand, self-motivation and a commonly agreed collaboration structure also played a critical role in allowing more formalised collaboration.

"Less clear purpose or some kind of benefit for each of the members does not really engage people to collaborate […] Clear assign activities to people will work? Yes, but then whether they want to do it or not. Because

I know they need a single assignees upon them, we are falling a structure,

I think by numbers" (Kulwant Pawar, Co-Founder of ESoCE-NET,

organising committee chair 1997-2004, ICE 1997 local organiser,

University of Nottingham, UK)

4.1.2.4. Routinisation of collaborative actions, and changes

Apart from the initiative to capture know-how and establish a commonly shared collaboration structure for each year's conference organising committee, several repeated patterns of behaviours and routines have also gradually emerged to enable the ongoing collaboration between the annual organising committee members.

- **Organizing committee meeting routine**

Meeting has always being an important way to keep track of the progress of conference organising, making decisions, transfer of know-how, and reflecting on experiences from previous conferences. Before the ICE 2000 conference, less structured and irregular peer-to-peer personal visits or joint group face-to-face meetings were organised to coordinate and monitor the collaborative works between the distributed conference organising committee members.

"Compared to German meeting culture, the organisation committee meetings are always being a big weakness. They usually occurred on a Sunday evening, quickly organised, without a real agenda, or it was a quick chat over lunch. So we didn't have much time to talk things through. The organisation meeting last year in Munich was one of few meetings where we took long time to talk about things, which was always previously a weakness in our organisation."(Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)

During 2000 as the collaboration between the organising committee members became stronger, the meetings became more formalised. Telephone conferences were sometimes organised, but these were costly.

> *"It has been a real collaborative work with the organising committee [...] Basically there is a strong input from the organising committee in ICE 2000." (Olivier Roelle, ICE 2000 Local Organiser, ADEPA, France)*

Nevertheless, because of the multi-national culture of the team, the process of organising these meetings has been an ongoing learning and adopting process.

> *"There were significant differences in meeting styles and behaviours of committee members. Robert and Marc have Italian and French ways of organising. Klaus-Dieter and I are very German. So in the end no one was really responsible. Nobody was responsible, but all were responsible. Everybody shared some responsibility to some degree. Everybody did those things which he could do best; that was probably the best thing in the conference."(Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)*

During the organising of the ICE 2004, 2005, and 2006 conferences an average of 7 or 8 telephone conferences were organised throughout the year with clearly defined meeting agendas (Figure 21).

> *"We also had regular or irregular meetings. When we were concerned about Helsinki, then we introduced regular teleconference for every two weeks. This was when it is in critical phase. Otherwise there was little*

responsibility for the organising committee." (Firthjof Weber, ICE 2001

local organiser, Airbus, Germany)
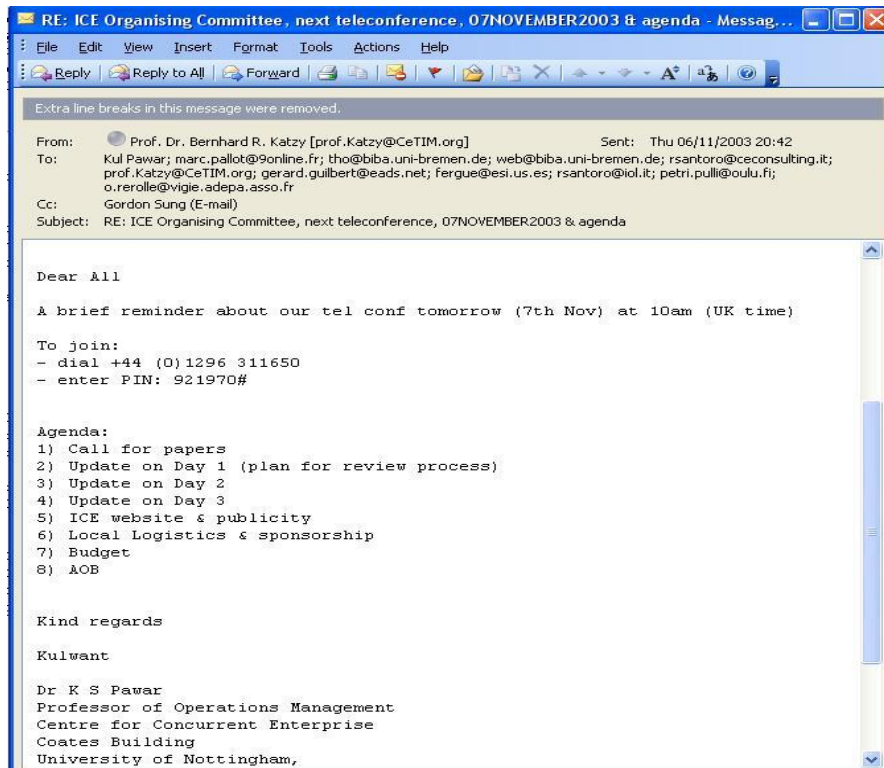
Figure 21: Typical organising committee telephone conference meeting routine

At beginning of 2005, Skype internet meetings (Figure 22) were gradually replacing the high-cost telephone conferences and improving the effectiveness of these calls in reaching the different organising committee members.
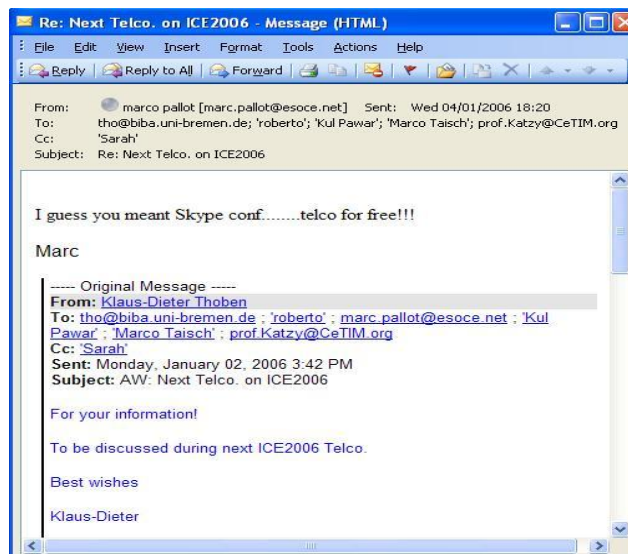
Figure 22: Example of reference to a Skype conference

In addition, 1-2 days prior to the start of each year conference, the organising committee members met and reflected on the experiences and performance of the organising.

Figure 23: Example of lessons learned and reflections in an organising committee meeting[12]

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[12] Source from ICE 2005 Organising committee meeting minutes in Munich 23.02.2005

- **Paper submission and reviewing routine**

Since the introduction of the call for papers prior to the 1996 conference, paper submission and reviewing have always been a critical operational routine of the organising committee. However it was not until 2001 that the first formalised process for whole routine was implemented.

> *"One change with Klaus-Dieter in particular is the paper reviewing process, and the whole process, call for papers […] For the paper reviewing process, I myself have contributed quite a lot to formalise the process [...] For submission of the abstracts and papers the authors have good templates, checklists for authors on writing a paper and presentation. Instruction for the session chairman, there were also instructions on how to structure the recommendation for papers, then there was a Word template with a lot of functionalities and formatting to consolidate the format, so we have one common look and feel format."(Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)*

Furthermore, in 2004 a workflow system was introduced, which directly matched with the reviewing process steps that were defined in 2001. Nevertheless, because the system introduced in 2004 was too rigid to be easily changed and updated, a new semi workflow system was later introduced for the 2007 conference. Several few subroutines have been changed due to this new change in the system, but the main steps still remain the same.

Despite the later changes of the subroutines of paper review due to the switch of the systems, the successful establishment of this routine is very much based on clear commitment and responsibility of the organising team members.

"I also modelled the overall paper reviewing process, all the different steps, who is taking care of what. The others were not really seeing that, because whole reviewing process was handled by Klaus-Dieter and me. I was responsible for call for papers, and for the processing of the papers. Klaus-Dieter was responsible for reviewing and setting up of the programme. The others were not so much involved, so this process was not so relevant." (Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)

Apart from the paper reviewing process, style of the paper submission has also undergone several changes. During the early conferences, a one page abstract was requested, then two pages and later a four page extended abstract. In 2002 discussion on whether to introduce full paper submission and review was initiated. Finally in 2004, the full paper review was introduced, but due to the overall delay of the paper submission, a decision was made to go back to two stages of paper submission for the 2007 conference; first a four-page extended abstract and then a full paper.

"[…] full papers produce more delay, require more time for people to work […]Are we asking or not full paper? If not, what are we asking?"(Roberto Santoro, President of ESoCE-NET, ICE 96, 02 local organiser, Italy)

- **Marketing routines - call for papers & final programme**

Marketing of the conference started from the very first conference in 1994. Nevertheless, the marketing approach was very much based on personal contact. In 1997, a first academic call for papers was introduced, and in 2000 both a call for papers

and a programme were sent to more than 3,000 people. In addition a local media campaign, news and magazine were also introduced, but later proved not to be very effective.

"We tried to invest some money in advertising, but it is not so good"

(Olivier Roelle, ICE 2000 Local Organiser, ADEPA, France)

Later on, in 2004, only the call for papers was sent, and in 2006 all the sending of paper documents (call for papers and final programme) were stopped.

"In 2000 we sent out by post, to 3,000 people, both the call for papers and final programme. In years '04 and '05 we only sent out the call for papers. Nowadays, I mean 2006, we don't send out any of the documents, neither call for papers, nor conference programme. We are providing these on a direct basis, giving them out at different events, workshops and meetings that the organising committee members attend, in order to save the cost." (Olivier Roelle, ICE 2000 Local Organiser, ADEPA, France)

Proposition for strengthening ICE marketing:

ICE Marketing channels and mailings:

- Stop personal or mass-postal mailing of Call for Papers proved not cost efficient. Probably less than 100 participants received the call by post (>28 Euro per participant), most did come without.
- Increase cross posting with other email lists:
    1. for privacy and confidential reasons, the only solution
    2. is commonly used and accepted
    3. identifying, agreeing around 8 to 10 existing email databases owned/operated by Organising Committee members (consisting simply on First Name, Last Name, Organisation, email), so far identified:
        a. BIBA (500)
        b. VE Forum Database (2000)
        c. ESOCE (??)
        d. AMI family (??)
        e. IMS NoE (Marco, ??)
        f. IEEE Engineering Management Society European Chapter (200)
        g. … . Collect further committee members database
    4. parallel and coordinated use (by the ICE marketing coordinator) of all these agreed databases for ICE marketing:

        Each database owner/operator will keep privacy of its list and will ensure himself the emailing in link with the marketing coordinator.

- Increase personalized and targeted e-mailing, at least addressing 3 main categories:
    1. Organising Advisory Committees (50 people)
    2. Past Authors (150)
    3. ICE updated users list (VE Forum system, 520 users, from 2004 & 2005)
    4. all databases together

Figure 24: Decision made to change the marking approach

4.2. CASE B: ARC IP -BUILDING AN INTEROPERABLE ROADSIDE ASSISTANCE SYSTEM

4.2.1 Case background – the vision to create an European wide roadside assistance service (1994 -2006)

4.2.1.1. Road assistance industry

A "Yellow Patrol Van" is the first association with a European Automobile club in most countries. They offer encompassing assistance services not only to their members whenever a car or its passengers are in difficulties. Almost as long as cars exist, automobile clubs provide road assistance in nearly each European country.

Figure 25: Major European Automobile Clubs

They offer membership to car owners and drivers who then share encompassing services around automotive mobility. This includes free assistance services from the club's fleet of yellow assistance vans as well as maps from the club printing house, testing of cars, air-rescue services by helicopter and plane, a club magazine, the club travel agent, just to name a few. All big clubs like the German ADAC with 14.4 million members, the Dutch ANWB with 3.5 million members, and the British club AA with 12 million members do offer these services predominantly from their membership fee.

Road assistance has become an industry of its own, with market size of approximately 142 million people under the roadside assistance service cover in the entire Europe. Besides the road assistance clubs regional garages and tow companies are players in the market who partly compete with the clubs and partly cooperate as their suppliers in providing road assistance services. Others, like Insurance companies and auto manufactures are gradually stepping their feet into this market as an additional service to their customers. Membership with a club, on the other side, is similar to an insurance contract. It does not wonder therefore that insurance companies are players in that market and account for around 35% of the European market share. Despite the threat from the insurance company, the clubs still have strong believe in sustaining their competitiveness against the threat.

> *"An insurance company does insure you against financial risks of starving, the road assistance clubs do bring water to the desert" (Volker Knapp, Chairman of the Board of ARC)*

The early 1990s brought a radical change in the industry when motor manufacturers entered the market of road assistance in the attempt to retain relationship with their customers throughout the life cycle of the car. Their move was motivated by decreasing

brand loyalty and the drastically extended maintenance cycles, which from that time on required cars to return to the garage as little as once a year. The automotive manufacturers perceived offering roadside assistance to their customers as one way of improving customer retention with psychological impact: responsibility for a broken car is associated with its manufacturer who then as well provides the solution. Non-European automotive manufacturers called for Europe-wide road assistance service, which would match their distribution organizations and could be managed by the European importer and delivered for the national distribution organization.

This market development coincided with strong growth of cross-border traffic and cross-border travel since the mid 1980s at a rate of more than 10% annually. And it was forecasted that this growth would rather increase with the opening of European borders and the emerging European awareness. These trends were backed by statistics on road assistance incidents, car breakdowns, accidents, and thefts, which all showed growth at similar rates.

Before the year 1990 the market leader in road assistance services was the respective national automobile club, with the exception of France, where a no established club existed. The national structure of the clubs and the emerging European market for road assistance was increasingly perceived as a competitive threat.

4.2.1.2. A starting point for collaboration:-the creation of ARC Transistance S.A.

In 1991 eight major European automobile clubs, AA (United Kingdom), ACI (Italy), ADAC (Germany), ANWB (Netherlands), ÖAMTC (Austria), RACE (Spain), TCB (Belgium), and TCS (Switzerland) created ARC Transistance to offer roadside

assistance services to the car industry on a Pan-European basis. Figure 26 gives the initial share distribution of the ARC Transistance S.A., which has not changed since.
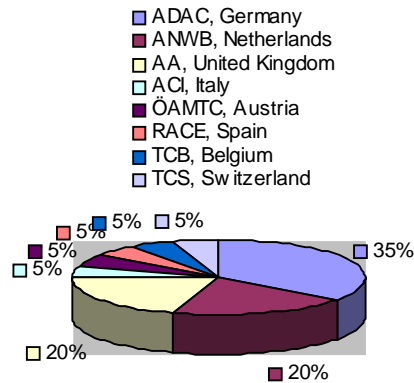
Figure 26: Share Distribution of ARC Transistance among Eight Founding Clubs

> *"The mission of ARC is first to combine the network services of ARC to a*
> *pan- European network and second, to offer roadside assistance services*
> *to the car industry and gain a high market share on that market sector"*
> *(Volker Knapp, Chairman of the Board of ARC)*

Pre-existing national B2B (Business to Business) contracts remained with the national clubs. Today ARC Transistance is the European market leader in providing in B2B roadside assistance services to the auto industry, and has market share of 31%. Each of the clubs involved is typically the market leader in its own country.

In the decade since its foundation, ARC Transistance has further extended its network operation into 36 European countries from Iceland to Turkey, and from the Ukraine to the Canary Island. Especially after the fall of the Berlin wall ARC Transistance has licensed its concepts to newly founded clubs. By the year 2001 the ARC network covered more than 9 million vehicles through BtoB contracts, with European-wide geographical coverage, and 36 of the 42 auto manufactures as customers, 12.000 patrol vehicles and tow trucks as well as 12.000 contracted service provider vehicles patrol

European roads. More than 40 million phone calls are handled with 1900 call centre staffs in 36 European countries.

4.2.1.3. Operation of ARC Transistance

ARC Transistance takes the responsibility to negotiate B2B type of road assistance contracts with the auto manufactures on a Pan-European basis. Some of the national B2B contracts still remained with the individual clubs, just like service delivery and all operations. ARC Transistance did not build its own operations but coordinates to combines the network of the clubs. ARC therefore is also actively involved in coordination of the network activities, including the definition and monitoring of service level standard for the contract signed with the auto manufacturers.

> *"ARC is not a club itself, ARC is a coordination body for the clubs"(Volker Knapp - Chairman of the Board of ARC)*

Margins of the B2B contracts are much lower than what the clubs are used in their business to the Club members. This does not surprise given the purchasing power of the few large auto manufacturers that is considerably stronger than the power of the many club members. Beside its missions to combine the clubs' services a second dominant objective emerged as creating synergies and efficiency gains from standardization of the ARC operations. The hope was especially to serve club members through combining purchasing power for example for tires, chains, and batteries.

> *"Both objectives have been reached within 5 years. Today we have 36 countries, and we are the market leader in that kind of services, but when ARC was first founded it was also seen and understood, that offering service to the car manufacturers and creating the European network were*

the priority, but not the only reasons to have ARC. ARC should combine

the service of the clubs towards their members at a certain time, and

secondly combine the purchasing power to make the club more efficient,

by doing things on a Pan European basis, not country by country"(Volker

Knapp - Chairman of the Board of ARC)

Prior to the formation of ARC in 1991 many of the eight national clubs operated independent services for their members travelling aboard through their own foreign 'key points'. These keys points were normally linked via the clubs IT system to their home club systems. Their task was to coordinate assistance services locally, establish their own local contacts and manage cooperation agreements with local clubs. Bearing in mind the long history of established individual European operations of each club, it does not wonder that operations practices did vary considerably.

Differences in operations further are driven by the diversity of the products offered from each national club: differences in service levels, different cultural backgrounds, national or even regional languages, and individual operation systems make coordination and management of a European ARC Transistance Network a challenge task, as the CEO of the ARC Transistance described:

"The major shareholder clubs of ARC are generally long established, and

successful organization, and often built their own operation systems,

trained their own staff and developed their own operation methods in the

way that suits their own market needs"(Andrew Johnson – Chief

Executive ARC Transistance)

From the beginning of ARC Transistance therefore has launched a number of cooperative activities, including member benefit programmes, data exchange, joint

purchasing and in car Telematics services, in order to gradually harmonize operations as well as products and so integrate the ARC Transistance network into a more cohesive pan–European road assistance organization.

4.2.1.4. First concrete activity: Joint Business Development of ARC with the Creation of ACTA S.A.

France was the only large European territory where no strong national automobile club was present and roadside assistance services normally were covered as insurance contracts. The south of France has always been a prominent tourism destination in Europe and therefore France had seen a long history of Dutch, German and English local key points.

During the year 1992, ACTA France was created to complete the ARC Transistance Network in France and to fill that gap of an absent strong national automobile club. (Figure 27)
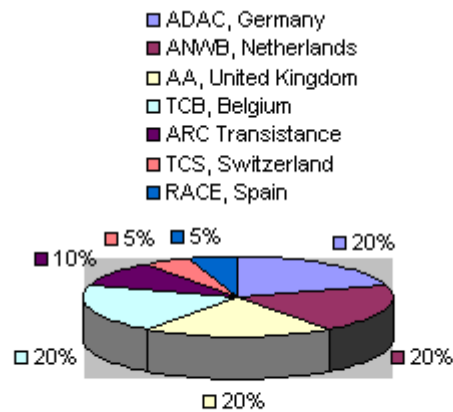
Figure 27: Share distribution of ACTA S.A.

The mission of ACTA S.A. was first to provide roadside assistance services to individual club members when they travel abroad, and second to gain a certain degree of market share for the clubs in the French market.

ACTA France was operatively created through bringing the Dutch, German and English key points together in the same location and under unified ACTA management. Today ACTA France is headquartered in Lyon, employs 140 permanent staffs and handles about 120.000 road assistance cases per year. However, the French market is still dominated by big insurance companies, which offer roadside assistance within their insurance packages.

> *"In France we sell assistance together with the insurance. We are not too competitive in price, because we are too small, and have too many structural costs to divide over relative small amount of files. We are now trying to sell insurance for assistance and hope we will become more competitive." (Thea Maat - COO ACTA France)*

ARC France services their own customers who are covered by French ARC contracts as well as vehicles and drivers covered by ARC contracts of other motoring clubs. Besides these clients, ARC France also provides services on request to members or clients of many other clubs whenever a road incident occurs in France. Operations in all road assistance cases still are organized in the way that the claimant's entitlement to service is validated by data from his or her own club. The home club delegates authority to act as appropriate. Some smaller clubs use Lyon for service deployment only and fax a service request to Lyon to initiate service provision.

> *"The Operation vision of ACTA France, is to become an integrated European assistance centre operating under one system, and having a*

reasonable play on the French Market for road assistance services."

(Thea Maat - COO ACTA France)

4.2.2 Routinisation through jointly development of IT platform: the ARCIP Project (1994 -2003):

4.2.2.1. Project Rationale

Early experiences of cooperation for the B2B contracts and at ACTA France created awareness amongst the chief executive officers of the ARC Clubs that:

"Incident management is a pan-European affair and incident management services should be provided to a European citizen according to the highest standards."(Project Periodic Progress Report)

The vision of the CEOs was that an operator anywhere in Europe should be able to clarify the entitlement of a club member to receive services and if applicable be able to communicate in his or her native language, manage the incident in co-operation with the local service providers, and bring it to successful completion.

The ARC clubs each used computer systems to support their member services and to maintain databases for management and marketing information. Each club invested heavily in systems that support similar functions but used different hard- and software. There was the expectation that combining development and maintenance of operating systems could once again bundle the purchasing power of the clubs and generate synergies.

Synergies were further expected from standards that support efficient pan-European information exchange. The manifold independently developed systems of the clubs did

not allow inter-operability, hence for example all ACTA service request had to be printed and faxed and re-entered into the operating system.

Further synergy potential was obvious because most of the larger clubs (AA, ADAC, and ANWB) implemented their own service operations systems at home and provided terminals of their own operating system on the premises of other European national clubs. Thus many clubs were investing in international road assistance networks that operated in parallel and fully independent.

4.2.2.2. Starting point of the project: benefit alignment

During the year 1994 cooperation conferences were regularly organized every six months between operation managers and IT system development specialists from all ARC clubs. During these meeting IT specialists and operations managers co-operated and looked for an opportunity to exchange information, skills, product and experience, and to come up with a first list of priorities for the ARCIP project.

> *"Members of the computer system side for each club and for the operations side often have quite big meetings, where people are giving presentations of different subjects of their own clubs."(Graham Warner - Project manager of phase I and IT General Manager of AA Membership until 1994)*

All involved partners documented results of these meetings as expected benefits to the ARC Network. Benefits as they were perceived from the ARC organization are summarized in Table 18[13]:

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[13] source: ARC documentation

- Increase speed to market with rapid introduction of new products, because development can be shared
- Support the drive for higher service level standards across Europe for all club members
- Provide standard management information
- Reduce system costs and provide potential revenue for future development via licensing fees
- Provide an ARC wide system and data communication framework with potential for further innovation such as for example Telematics entitlement checking, or mobile fleet management
- Provide economies of scale for the common development and maintenance
- Potential for a common system at Lyon with an integrated back office offering potential for improving operational efficiency

Table 18: ARC Expectation on the ARCIP System Benefits

On the side of the clubs expectations did vary between the larger and the smaller clubs.

Large club more focused on benefits collected in Table 19[14] :

- Interface to home club patrol deployment system
- Support for complex, low volume road assistance products
- Piloting of new road assistance products
- Foreign traveller support for both home and foreign members

Table 19: Large Club Expectations on the ARCIP System Benefits

Smaller club rather prioritised the benefits, which are given in Table 20[15]:

- Off-the-shelf package system supporting both domestic and foreign business
- Low level of local IT support required
- Ability to implement Front and Back office independently

Table 20: Smaller Clubs expectation on the ARC System Benefits

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[14] source: club documentation

[15] source: club documentation

Champions of the ARCIP project was a working group of the clubs IT departments, which established their own set of priorities as given in Table 21[16]:

> • First true language independent system effectively able to translate data via comprehensive lists of incidents, actions, vehicle data, etc
> • The use of ARC codes rather then free format text will facilitate more comprehensive, consistent meaningful management information
> • Common and easy to use system leading to shorter training times
> • Real-time entitlement checking will reduce fraudulent usage and service abuse

Table 21: Club IT Service Expectations on the ARCIP System Benefit

4.2.2.3.   Creating a common working language – common data standard (1994 – 1995)

With the assignment for the project being given in 94, exploratory talks were initiated about the development approach for a system, which should be interoperable across all European clubs and should efficiently support pan-European business operations. A core project team of the most experienced club IT departments of ADAC, ANWB and AA was set up to take the lead. The initial approach for the project was to develop a common data standard, which would allow different club systems to talk with each other. As the project manager described:

> *"From that we did actually develop the data standard, we wanted to actually capture common data, data structures and coding structures in order to facilitate the transfer of data across the virtual network"(Graham Warner - Project manager of phase I and IT General Manager of AA Membership until 1994)*

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[16] source: club documentation

However, data standard definition quickly ran into difficulties. It was almost impossible to define standard terms for different services that were provided by different clubs and which required different specific skills or resources that were not available, sometimes not even known within all clubs. Each club operated to service expectations of their members. These have been researched by the clubs as acceptable for their national members but would considerably differ between the different European countries. In addition the obvious European language differences created a further dimension of complexity when communicating.

4.2.2.4. 1996 – The Business Process Re-engineering Approach to the ARC System:

Around the turn of the years 1995-96 the project team therefore decided to go one step further and to define common business process model for international breakdown assistance services. Again, this was a rather complex process as the project manager described:

> *"Within the project team we developed a business process model. We probably have more than twenty versions. It was not anywhere near perfect and we did have a lot of problems with compromising the business process, because there is no such thing as the one and only business process. So, we actually did compromise quite a lot."(Graham Warner - Project manager of phase I and IT General Manager of AA Membership until 1994)*

Once having them drafted the project team actually went to promote the business process model to all clubs involved. The cooperation conference where all IT personnel from all the shareholder clubs were presented seemed the appropriate occasion:

"We promoted this business process model and went through it with some details, and we asked everybody to brainstorm and write down their business processes to see whether it fits well. The results of it were a few minor changes only."(Graham Warner - Project manager of phase I and IT General Manager of AA Membership until 1994)

By the end of the year, the project team did manage to come out with an agreed business process model, which described standard business processes for supporting customers and members with road assistance services across Europe (Figure 28).
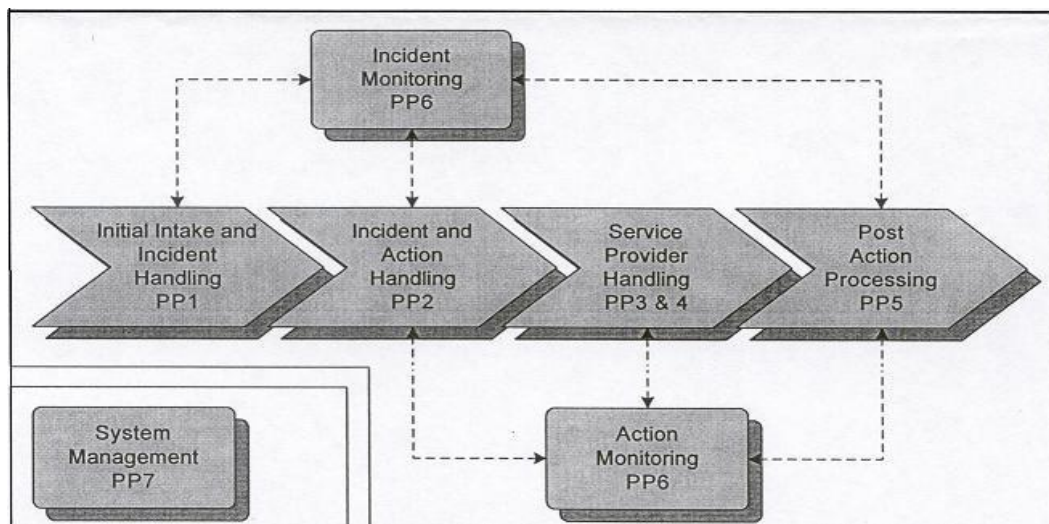
Figure 28: Main Business Process of ARCIP Project

Two general types of assistance processes were defined: the Front Office and the Back Office.

- **The Front Office**

Whenever an incident occurs, the customers will call a dedicated telephone numbers for assistance. This phone call will be directly handled by the Front Office, where the operator will register the incident, and check for which types of services the customer is entitled. According to the types of contracts that the customer is associated with his or her club the service level is defined. This process can be intricate, for example when the

customer has a personal membership, plus a membership via the rental car or the auto manufacturer and potentially a third or fourth one via his employer or the credit card company. Once the entitlement is established, the member will be informed about planned actions. Actions finally result in orders to local service providers, which are sent to the Back Office.

- **The Back Office**

The Back Office Having receives the action requests from the Front Office and organizes services fulfilment. Back Office normally has no customer contact and has no instance responsibility. Its responsibility and mandate consist of the implementation of Actions, managing the Service Provision and the adherence to specific limits, e.g. costs, deadlines and priorities. The Action and conditions of implementation are defined by the Front Office. When the service is completed, the Back Office will send a message to the Front Office to deactivate the action. In some cases the Front Office can place orders directly, for example with garages for towage, or other immediate first actions. In some cases, other orders are also given by the Front Office, rather than forwarding to the Back Office.

Based on the ARCIP philosophy the front office should only handle the call, entitlement checking and selection of services offered. The integrated back office will then undertake the deployment of all other service orders. A side benefit of this integrated approach would be a better control of (double) invoiced services. All information exchange between the Front and the Back Office between all clubs would then be realized via automatic electronic transfer, rather than send through FAX or telephone.

Again the project team did not so much struggle with the conceptual ideas of the business processes but with organizational and national culture and language

differences. Collaboration was rather difficult, permanent translation and numerous meetings were needed to ensure that all partners did grasp ideas behind the project.

Despite the generally accepted achievements the project faced a lack of funding to sufficiently push it forward to full completion. At that point in time the ANWB introduced the idea of looking for additional the funding form the European Union and the Dutch consultant PNO was called in to assist the process of obtaining it.

4.2.2.5. Introducing Large Scale Professional Distributed Project Management for the ARCIP Project in 1997

In December 1996, the European Union granted funding to support the full development of the project under the name of ARC Interoperability Project. The objective is to develop a common business operation system, which can be used for all European clubs. In the subsequent year, a large international project organization was formed including the project supervisory board, chaired by the Dutch club. Additionally the senior operation representatives of all eight shareholding clubs of ARC formed the Project Board to provide necessary decision-making power.

> *"We have to make not only the technical decisions but also the political decisions, because Interoperability has a lot of influence on the running of different clubs. Therefore apart from the technical experts, we also have operational people to take care of other interests of their home clubs. Despite the fact that, I am the chairman of the project board, I also have to make the decision on the behalf of the ANWB"(Jan Barkhof – Vice Chairmen of ANWB Executive Committee, and Chairmen of ARCIP project board until 1998)*

The operative project work is structured in special working groups, which again are staffed by the three clubs ADAC, ANWB and AA plus RACE, the Spanish club and ACTA France. Their tasks were to perform one step in the general systems engineering process each: to develop the functional specifications of the system, to build the system, to implement the system, and finally to test and validate the system. A further project team was set up to provide quality management throughout the development process (Figure 29). All shareholding clubs of ARC were responsible to provide feedback on the development.
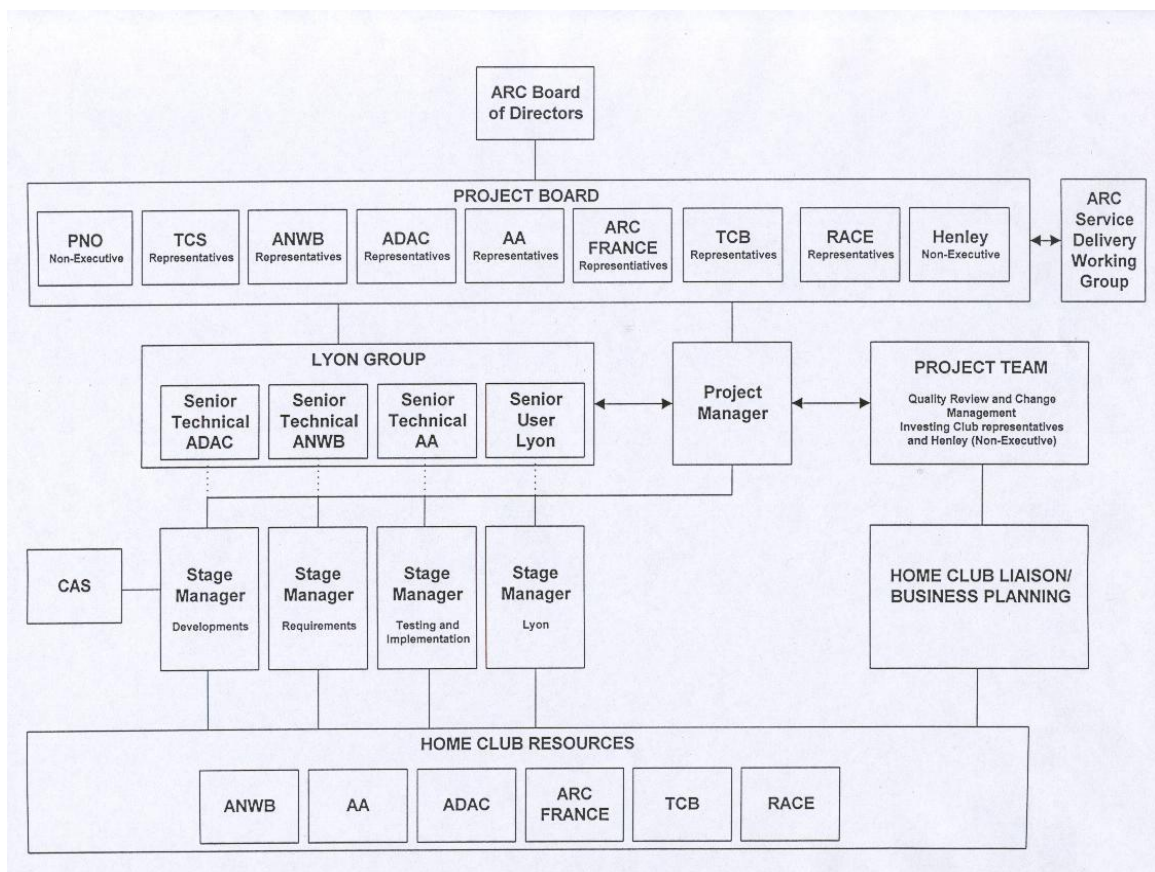
Figure 29: Organisation of the ARCIP Project

Special emphasis was in the research framework of the European Union is on user integration into the development process. Therefore a pilot test case was already required for Phase I of the ARCIP project to allow for permanent and concurrent

validation of requirements and specifications. The planned result of Phase II was a working pilot system, on the basis of which the full-scale system could be developed, implemented at AA and RACE and tested in Phase II.

ACTA France was a choice for the early test bed. In Lyon four of the major ARC clubs key points were already present and functioned independently within the same building. The multi-national test scenario, which was regarded crucial for validating the pan-European viability of the project, was available in a nutshell. Technically this choice seemed to make sense because the ACTA France operation system of that time still was a "free text" system, which needed to be replaced with a more sophisticated and reliable system anyway. Support from ACTA France seemed guaranteed and in their best own interest because the projected growing market demand in France demonstrated a clear business need for ACTA France.

> *"To us it is very important, because we have a combined office in Lyon, which was first created by ANWB, due the travelling behaviour of our members and later joined by the German and English clubs. However, having different IT systems operated by different clubs, the integration in Lyon was not easy." (Jan Barkhof – Vice Chairmen of ANWB Executive Committee, and Chairmen of ARCIP project board until 1998)*

The project plan was designed to first undertake Business Process Re-engineering (BPR) steps towards a single process for international incident management among ANWB, AA, ADAC, RACE and to validate these processes at ARC France. ARC France would then become the pilot model of a virtual pan-European assistance organization for the re-designed business processes, and supported by a specific IT solution. In a second step the results and experiences from the ARC France can be used

to improve the ARCIP system and as a demo centre support Europe-wide roll out of the interoperability software to all clubs, for an increasing range of service products, and eventually to other related service organizations such as fire brigades, police and hospitals, but that would be for the far future to come.

4.2.2.6. Project development

With all responsibilities allocated following best practices in system engineering the work was systematically carried out in work packages, and once each stage was completed, it was passed onto the next stage.

Based on the specified business process model, the Dutch team was charged to develop the functional specifications in the years 1996 and 1997. They started to collect and specify the functional requirements by keeping close contact with the operations managers from ACTA France. By the end of the functional specification stage, four main business functions were specified: Intake (call handling), Incident Management, Service Provision, and Accounting. These were to be supported by standards for 'Entitlement Checking' and 'Incident Data Exchange', standards for 'Incident Deployment Data', and standard for 'Accounting' and 'Inter-Club Cross Charging'.

The functional specifications were then passed on to the German team, which was responsible to build the actual software system. ADAC decided to out-source system implementation to CAS, one of its external software development houses on a fixed price basis.

By February 1997 a first warning signal on software development delays was issued as a result of extended negotiation regarding the degree of functionality that could be incorporated within the short time frame of implementation in Lyon, which was scheduled for June 1997. At same time the ACTA management had decided that the

implementation of a new systems, and new business processes with organizational changes could not be undertaken during their summer peak processing period.

Project management opted for an alternative strategy of a "prototype testing" approach and limited programme testing in order to deliver a system on time for acceptance testing, which was scheduled for April. When the software handed over to AA for user acceptance testing, this strategy fired back because the system failed to pass user acceptance tests and the decision was made not to implement until later in the year.

> *"I don't think communication is good, there wasn't a proper strategy in place. There is also not enough integration for working together, certainly not keeping users involved throughout the process. Therefore, when the application was handed over for user acceptance tests, there were a lot of things that are not acceptable."(Tim Weston - Business assistance analyst AA)*

During the project board meeting in May 1997 the software was returned to CAS for further programming, system integration testing and incorporation of the change requests from the user testing at ACTA Lyon. It was decided to run a full performance and volume test with the system prior to any further rollout to avoid further user frustration. The new schedule was targeted to coincide with the move of ACTA to a new building in Lyon, during November 1997.

4.2.2.7. Towards a new implementation attempt for the European Incident Management System

Convincing results of the project were still missing. In 1998 the project board was re-formed under the leadership of Andrew Johnson of the AA (now Chief Executive of

ARC) and developed a strategy plan to correct the errors in this phase and for the way forward to meet the original objectives of the project. Three major priorities have been identified (Table 22)[17].

> • Separation of Front and Back office implemented for ACTA France only
> • The further development of the generic solution by incorporating additional services enabling the solution to be extended to AA and ADAC at Lyon
> • The implementation of an AA RACE link. AA will use the generic system whilst at that stage RACE planned to adopt the data standards and incorporate it into its current legacy system.

Table 22: Management Priorities for Phase II ARC System

During the second half of the year 1998, the phase I development was expected to reach its final stage of development, but it was already certain that the system would still show serious problems with stability and response times, and that a number of essential modifications would be identified during the testing. Finally implementation then had to be delayed further with the next milestone being 12th May 1999 to avoid the peak Easter bank holiday period.

Acting upon the recommendation of independent reviewers assigned by the EU, the project initiated a technical audit, which was jointly carried out by AA and ADAC experts. AA, ADAC, and ANWB teams also further evaluated the impact of the revised architecture upon the software and hence effects upon the development project plans of Phase II. Phase II was put on hold until the fourth quarter of 99, due to the development delays of the phase I system.

The major findings from the technical audit were that the Phase I system did not provide a suitable platform for implementation of the ARCIP phase II. Particular concern was

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[17] Source: project documentation

expressed about the lack of coherent business requirements, the lack of a component based software model and the lack of consistent up-to-date system documentation. Based on the outcome of the technical audit, three major recommendations have been issued (Table 23)[18]:

> • The phase I system needs be stabilized and delivered
> • The application and the system architecture need be re-defined to allow definition of the technical components based upon business functions for the phase II system.
> • The phase I system needs be re-structured based upon the define component architecture.

Table 23: Recommendation of Technical Audit on Phase I System

Finally in September 99 the phase I prototype of the ARCIP system that was based on the common data standards was implemented for ACTA France in Lyon. Implementation and rollout were a success; the system has been running smoothly in ACTA France since the implementation. However, after all the discussions and delays, scepticism remained throughout the ARC network. Typical reproaches were that it is only a B2B system, which is entirely tailored for the use of ACTA France, that the requirement for an interoperability system therefore were not defined, that the front and back office are still not separated, or that it is only used in ACTA France. In short one club manager put it as: 'The project and the system development have been highjacked for ACTA Lyon'.

Analysis by the restructured project board identified project communication during the testing of Phase I as a considerable weakness. People doing the testing of Phase I did not have sufficient involvement in the early stages of the requirements analysis and the

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[18] source: project documentation

software design process, which led to numerous misunderstandings and was difficult to correct in later project stages.

> *"We started very disjointed, with ANWB in charge of functionality and analysis, ADAC in charge of system build and AA in charge of test and implementation; and things were done in a rather isolated manner. We introduce a group for quality review, stage managers, as well as change management, but the effect was limited"(Gaynor Clarke of the AA – ARCIP Project Manager 1997-2000)*

4.2.2.8. Re-establishing the Link Between Users and System Developers

Based on the outcome of the technical audit and the recommendation made a great deal of work had been undertaken to identify a phase II strategy, which would best address these insights. ADAC also went on to identify four technical options for a revised phase II development based on the knowledge and experience gained in the phase I. In conclusion, the focus of the project should be changed from an integrated monolithic pilot to a modular system, which can freely be assembled towards a true pan-European operation platform. The recommended solution for the phase II incorporates insights from IT system implementation technologies, especially the component-based approach in a three-layer architecture, which is generally accepted as being superior to the simple pilot implementations that previously were envisaged. Table 24 lists the independent reviewer recommendations:

- The ability to separate Front and Back office functionality and link to Home club systems
- Home club control over which product elements and services are to be managed by the home and local clubs
- Linkage for comprehensive real-time entitlement checking limit verification via home club databases
- Incident management including continuation across borders
- Interclub operational and financial information exchange
- Management information and the provision of base for customized reporting

Table 24: Independent Reviewer Recommendations for Phase II Development of the ARC System

In addition to the independent reviewer recommendation the Project Board defined further requirements for the development (Table 25):

- The full implementation of the ARC data standards and language independence
- A modular structure reflecting the agreed generic business processes
- The potential to interface with home club call-handling, deployment and Telematics systems
- A flexible system providing ease of implementation, maintenance and scalability

Table 25: User requirements for the Phase II development of the ARC System

However, such fundamental redesign of the solution would generate additional cost, which was estimated to exceed the previously agreed budget. A new business plan to support the proposal was therefore submitted for discussion to the ARC Board of Directors on 22nd October 1999.

A preparatory one-day meeting for users and technical representatives of the clubs and the University, which was coaching the Business Process Reengineering, was held in

July 1999 to validate the Phase II approach. Further high level recommendations emerged from this meeting (Table 26):

- AA and RACE to map their current business processes
- User representatives from AA, RACE, ADAC and ANWB to work together to clarify, agree and map proposed business processes. This activity is to be undertaken during workshop sessions with NTU acting as facilitators and advisors

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Table 26: ARC Requirements for the phase II System

Based on the submitted case the ARC board of directors authorised the project to continue with Business Process Analysis, the development of the communications backbone and further requirements analysis. In the meeting the project was replaced to signal the new start the new project under the leadership of Andrew Johnson was named: ARC-TIME - Tailored Incident Management Europe – TIME.

Right after the decision the project increased its effort to involve users with a set of three days workshops that were started in the course of November 1999. Workshops were continued until January 2000, with the aim to capture the requirements from as many users as possible and to validate the feasibilities directly with the technical people. Therefore both, users and technical representative from most of the clubs attended the workshops. All workshops started with an introduction into the principle of Business Process Reengineering and then proceeded with team exercises to map business process on paper. Attendants to the workshops varied from time to time which did actually slow down the process of capturing the entire business process.

"It is difficult to get different people from different clubs in order try to obtain a generic solution, there was lack of consistency."(Tim Weston of the AA - ARCIP Business analyst and Implementation Manager)

" The workshops did help for the users, but the problem is still the same, things were starting very well, everyone was attending the workshops, but at the end we were only left with a few clubs which were directly in charge of the system development"(Belén Yome - Assistance Centre Manager of RACE and Senior User)

During the Business Process Analysis exercise no constraints were placed upon the workshop participants as to which processes should be identified or what result they should present. As the results workshop participants specified the full range of processes, which they would like to implement.

The project subsequently experienced a further budget problem when ADAC revisited the initial calculation and estimates for the completion of the business processes that were identified in the workshops. The project board solve the situation through assigning a group of users and analysts from ADAC, AA, ANWB and RACE with the definition of shortlist of priorities for pilot implementation. The assignment explicitly asked the group to deliver a solution that would be satisfactory to the user community, capable of supporting core business, demonstrating and proving that interoperability is suitable to satisfy wider user community within the network of the clubs.

4.2.2.9.   Concentration of the Project on Highly Motivated Champions

At this stage, ANWB had more or less pulled out their human resources from the development of the project, and is only following it from a distance. ADAC and AA are

now in charge of user requirement specification, functional specification as well as system implementation and user acceptance testing. Consequently ADAC has put more resources and efforts into the projects from its own sources:

> *"We have high interest in the ARC TIME project, first because it is an important goal for ADAC to consider the different business processes and learn how to work together with different clubs. Second, ADAC needs a good future system for break down services, because currently all the service orders are sent through fax or telephone, there is a lot of time and effort wasted. We need a system, which can process the break down services information directly, on line, and share the common data standard within agreed business processes with other clubs."(Dietrich Heide - Managing director of the ADAC service company and Senior User)*

In June 2000 Andrew Johnson appointed a new project management team, splitting the technical development from the commercial and political management. ADAC provided an experienced IT development manager to the technical role and Leslie Holt, recently retired CIO at the AA was appointed as business manager 'Terms of Reference' were produced and first discussed in November 2000 to create a common understanding and 'language' to be used in the project. The decision of the new project board to fully involve the users led to a new set of user requirements, and functional specifications, which are delivered in March 2001.

The further project development during the year 2001 saw project moving ahead with development, and expecting to fully implement the AA RACE pilot for final acceptance in April 2002 (Figure 30).
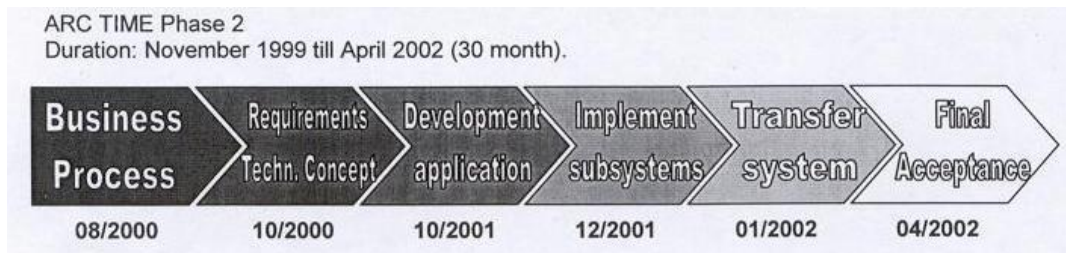
Figure 30: ARCIP Phase II Project Development

4.2.2.10. Towards a System Architecture that Evolves with User Needs

Due to the necessary limitations during the re-start of phase II, the objectives of phase II shifted from building a full-scale system to deliver a minimum infrastructure that is useable as operational platform and communication backbone. It should be suitable to prove the applicability of interoperability concept as well as to provide validated information on best practice in terms of managing international IT initiatives.

Thus, in order for the system to be fully exploitable, detail planning and costing of future development were carried out during 2001, and the ARC Board of directors have also approved the funding for detailed analysis of a subsequent third phase to manage the completion and roll out of the system. Definition of the user requirements and costs of this final development phase was completed in the last quarter of 2001.

Since the development of TIME (phase II), ADAC has shown strong interest in using the system developed by the project, by contributing resources in terms of system developers, project managers, and sufficient financial support. Therefore, ADAC has taken the lead towards the development of the roll out phase. The managing director of the ADAC Service Company and ARC Project board member Dietrich Heide describes this as follows:

> *"For ADAC, the first phase is the B2B business, which is to integrate other clubs into our organization in order to provide the service. So we*

have to find a way to make entitlement checking within our own system and give the order to other clubs. The next step is that other clubs are able to see a service order online in our system, reply to it, then take over the order, and finally give information back when the break down service car reaches the garage. In that way we try to bring ARC TIME phase III to the B2B area, and in future maybe to medical assistance and only then to the membership services."(Dietrich Heide – Managing director of the ADAC service company and Senior User)

However up to this point in time, apart from the pilot implementation of phase II system between RACE and AA, only ADAC and ACTA France have confirmed their participation in the phase III development, as the senior users of the clubs responded:

"We will push this activity in ADAC, and we will replace our stations abroard with the new system, then the site in Munich "(Dietrich Heide – Managing director of the ADAC Service Company and Senior User)

"To get a further investment, we need a quite sound business case, so from our perspective unless it shows significant improvement on time for processes and quality there is no clear reason for us to invest, because we are quite happy with our existing systems. And we are not going to invest in any system development in a short time scale. So we need to wait and see what it is going to be delivered, and look if there is any significant improvement to justify a business case"(Jean Pocock - European Operation Manager of AA and Senior User)

"We have to see who is going to use the system, and where they are going to implement the system, then we will decide whether it is making sense for us to participate"(Belén Yome - Assistance Centre Manager of RACE and Senior User)

"We are interested in adopting the data standard, and the backbone infrastructure, but we don't know yet whether we are going to use the software package or not, because we have our own software system to support our own operation"(Dorine Van Lammeren – Manager of ICT Department of ANWB and Senior User)

4.3. CASE C: WASLA-HALE- BUILDING AN UNMANNED AEROPLANEAEROPLANE

4.3.1   Case background – the vision to build a first European unmannned aeroplane

Unmanned aerial vehicles (UAVs) are not certified to operate in controlled airspace. They are relegated instead to fly within temporary restricted airspace, over oceans or above areas that are not densely populated. Some UAVs have operated alongside civilian aircraft over war zones including Bosnia, Kosovo and Afghanistan. However, they were limited to special-use airspace or to flying at altitudes above 50,000ft and there were occasions when civil aircraft were re-routed. These limitations severely curtail military UAV training and present logistical problems when deploying on operation.

Figure 31: Example of an operational military UAV[19]

The German Federal Office of Defence Technology and Procurement (BWB) has commissioned and funded the WASLA-HALE programme, which stands for Long

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[19] USA Global Hawk, Source : http://www.fas.org/irp/program/collect/uav.htm

Distance Imaging SIGINT Airborne Reconnaissance System – High Altitude Long Endurance.

Figure 32: WASLA-HALE UAV[20]

The main objective of the programme is to demonstrate techniques and procedures on how to guide a UAV in controlled airspace. This includes flying under IFR (Instrument Flight Rules) with sense-and-avoid manoeuvres

> *"The aim [of the programme] is to identify technology requirements for unmanned flying and propose technical solutions to those needs" (Dr. Holger Firehmelt, Head of the aircraft branch within the Institute of Flight Systems division at the DLR)[21]*

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[20] Source: www.janes.com

[21] Source: www.janes.com

Overall the programme consists of three phases, managed as three different projects. The project commenced end of 2000 with phase I, and phase III is anticipated to end in June 2008 (Figure 33).

Phase I	Phase II	Phase III
Sept 2000 Sept 2004	Sept 2001 Nov 2005	June 2008

| Compilation of requirements and a realisation background for a UAV system in civil airspace; resulting in a report. | Conversion of the theoretical report into a technological demonstration which can be controlled from a ground station. | Compilation of concepts for sense-and-avoid sensors. Specifying, choosing and integrating these |

Figure 33: WASLA-HALE programme course

The project comprises a total of five different partner firms, and on average 12 to 16 team members who work for the project on a fairly regular basis. This includes one definite point-of-contact person representing each firm and a further three to four assistant workers from each firm. In general the numbers of project team members vary over time, analogous to the project phase and man-power needed.

The aim, especially of phase III, is to demonstrate these capabilities in a flight test with DLR's experimental aircraft ATTAS (Advanced Technology and Testing Aircraft System), see picture on previous page. The results of this research programme will be implemented in future acquisitions of UAV's by the Federal Armed Forces of Germany for air reconnaissance purposes.

4.3.2   Routinisation through professional know-how and high motivation

4.3.2.1. Starting the projects / programme

Since the start of the WASLA-HALE programme in September 2000, concrete project milestone planning has been carried out to provide the basic framework of interactions between the partner firms.

> *"Actually the planning always runs in the same way. […] It is actually the standardised approach in our organisation (DLR). However, apparently the other partners do it in the same manner!" (Georg Hähnlein - Project Coordinator of Phases I, II & III, DLR)*

The overall detailed procedures of the planning routine are as follows:

- At first schematic block diagrams are created, in which the whole project is divided into several work packages.

- Secondly the individual work package descriptions are agreed upon; that means each work package is described with respect to its intention, its correlation to other work packages and the advanced input of other work packages which is needed to begin the following work package. Thereafter the resources to be used are ascribed to each of the work packages.

- Lastly all of the mentioned details are put into a time plan which resembles the actual project structure.

Nevertheless, the plan does not remain unchanged; it is flexible when modifications are required, delays occur, or new ideas emerge.

"One creates project plans, but they must basically also be revisable. There is no other way. If you have not got the necessary flexibility, it won't work." (Georg Hähnlein - Project Coordinator of Phases I, II & III, DLR)

"[…] whilst doing our work we came upon a good idea ... this and that one should now ... that would be good, if we could still implement that. And then we all had thereby the abilities and also the will to pull it through quickly. To now change or write any requirement documents would have killed the whole idea again." (Dr. Peter Stütz - ESG-internal project manager Phases I&II, point-of-contact Phase III, Institute for Simulation & Training ESG)

Apart from the flexible planning routines, a network project organisation (

Figure 34) was also set-up when the project started in 2000. DLR (Deutsches Zentrum für Luft – und Raumfahrt e.V.) is the main contractor to the military customers WTD 61 (Wehrtechnische Erprobungsstelle 61 in Manching and BWB- Bundesamt für Wehrtechnik und Beschaffung). Other project partner firms were also invited according to their competence profiles (Figure 35). A point-of-contact from each firm was also assigned to ensure formal and constant communication and coordination among the participating firms.

"[…] each firm had officially one point of contact, and in each individual firm there was then three or four people. Thus there are approximately 12 to 16 people, although in the background there are still more, which still works effectively." (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)
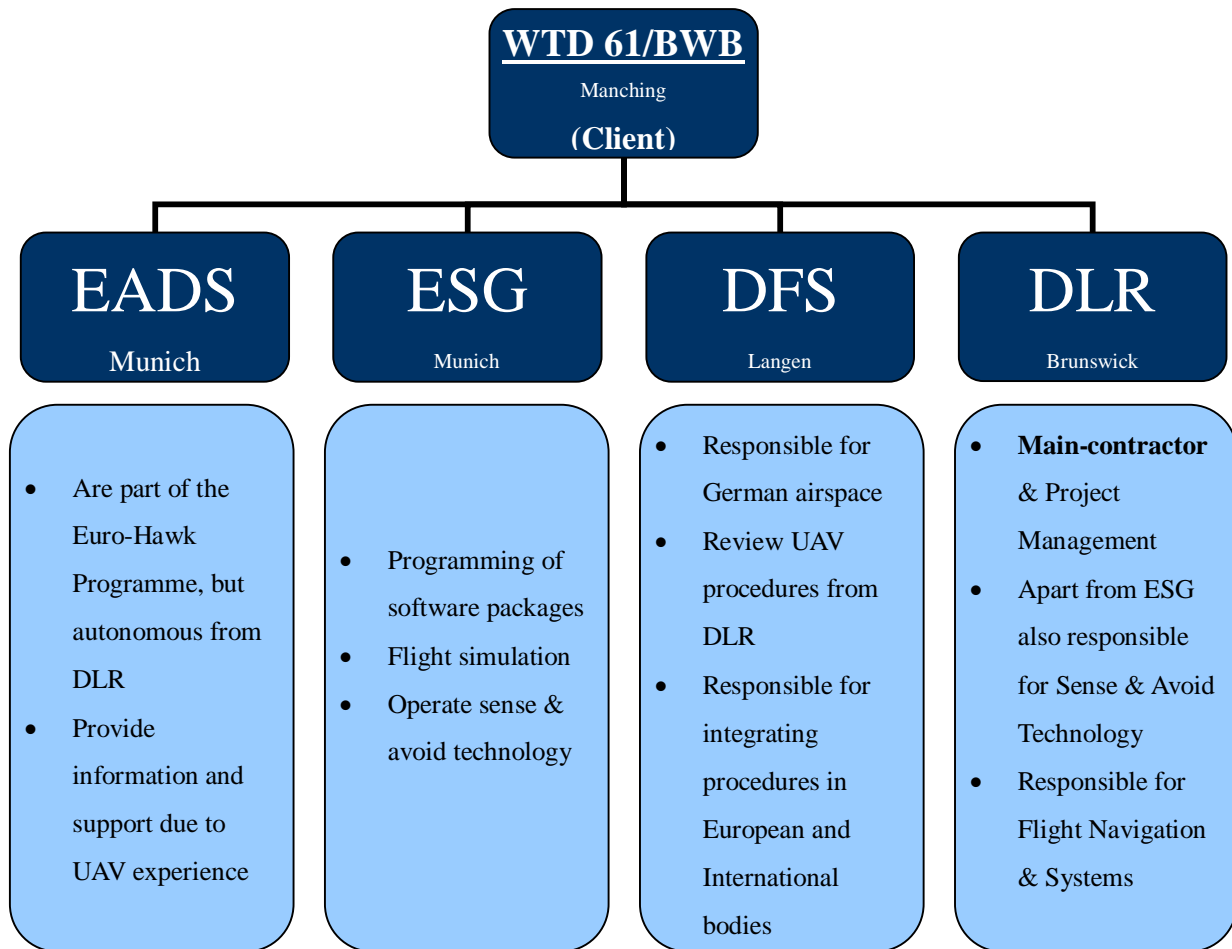
Figure 34: Organisation structure of WASLA-HALE programme

Despite the military nature of the project, the actual collaborations between the partner firms are organised under a relatively flat hierarchy.

> *"Well, we have tried to keep the whole thing in a very narrow hierarchy or in a shallow hierarchy. That ran very well, because responsibility therefore lay with the people themselves." (Georg Hähnlein - Project Coordinator of Phases I, II & III, DLR)*

> *"We knew the whole setting. I would not have come up with the idea to approach anyone else in a hierarchical manner." (Dr. Peter Stütz -*

ESG-internal project manager Phases I&II, point-of-contact Phase III, Institute for Simulation & Training ESG)

Bundesamt für Wehrtechnik und Beschaffung

DLR (HAN des BWB)
Deutsches Zentrum für Luft- und Raumfahrt e.V.
Research centre for aeronautics and space

EADS (UAN des DLR)
European Aeronautic Defence and Space Company
Global leader in aerospace, defence and related services

ESG (UAN des DLR)
Elektroniksystem- und Logistik-GmbH
Develops, integrates and operates electronic and IT systems for the military, public authorities and private firms

WTD 61
Wehrtechnische Erprobungsstelle 61 in Manching

DFS (UAN des DLR)
Deutsche Flugsicherung GmbH, Langen
Responsible for air traffic control in Germany

Figure 35: WASLA-HALE programme partners' profiles

Mature professional standards and past experiences in the similar development projects, have provide a good basis for the projects.

"The quasi-routines all result from a lot of experience. Experience with partners, experience with the contents of the project and with the experiment participators inherently." (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

"All the interfaces between the partners are basically already aligned, from past experiences; all of that mustn't be defined from scratch again." (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

Templates were also created in the starting phases of the project and are used by everyone throughout the project. They have proved worthy and this is self-evident by the fact that all the members use them routinely and regularly. In particular, the final report to the client at the end of each phase is delivered to a fixed template.

"It is so that this template already includes a certain structure and outline and of course contains the entire formatting etc. And then each sub-contractor fills the chapters he was responsible for. [...] I personally think this is very sensible, that is why we also follow this way. I mean it makes sense, because one can simply reduce the amount of work; if one were to reformat everything again that would mean a big load of work." (Jörg Meyer - Point-of-contact Phase III, EADS - Military Air Systems, Flight Management & FCS System Design)

"[…] there is no discussion upon the way in which a report has to be written, it is written in Word. That's just how it is! And then one makes a PDF. And in the same way it works with the platforms and communication means, one just adopts them." (Georg Hähnlein - Project Coordinator of Phases I, II & III, DLR)

Furthermore, most of the project team members already knew each other and are thus familiar with the interaction behaviours and the ways to deal with problems. For

example when there were delays, often due to technological failures, which finally affected the project's timing, they were tackled in a very "relaxed" manner:

"That [delays due to technical problems] is clear to everyone from the beginning and it's clear that delays will occur [...] That will just be communicated and changed respectively." (Andreas Udovic – Project Engineer of DFS, Institute for R&D)

"When it comes to a delay, everything runs in such way as in the initial mile-stone planning. One once again identifies the fixed milestones and distributes the design work upto these milestones respectively. In other words, the fixed milestones were identified first, and thereafter any changes proposed by the project manager were discussed accordingly [...]" (Jörg Meyer - Point-of-contact Phase III, EADS - Military Air Systems, Flight Management & FCS System Design)

In addition, there seem to have been some common subroutines which the project participates applied to approach potential risks. According to Andreas Udovic (Project Engineer of DFS, Institute for R&D) there are several escalation levels:

- First of all one would speak with the relevant person involved and ask where the problem lies.

- Second, one would go a step further to find out where problems occurred with other partners and offer them one's help to make up for the time loss (this is another example for an un-requested "community deed" to help the whole project although someone has made a mistake).

- Thirdly, if necessary, it has to be discussed with the next higher hierarchical level, which is the project manager or even the contractor.

In general problems are first discussed or regulated internally within each partner firm, then they are reported to the project manager, who finally then informs all project members of the potential changes and consequences.

> *"And that is the nice thing about it [the risk management procedure], that every team member gives it his best shot and says: okay, now we will just have to build a bridge and make sure, that the whole thing advances.'"*
> *(Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)*

Apart form the risk management procedure*s*, there are also several mechanisms which have been introduced or inherited during the project or from previous projects. Social relationship management is also another mechanism which is not formally planned but is seen by most of the project partners as a critical approach. That results in a large amount of self-responsibility, making "things work out" by themselves.

> *"If you ask me, it is especially these informal things [socialising with team members] which later on determine if a project runs or does not run. That is a very important factor!" (Andreas Udovic – Project Engineer of DFS, Insti-tute for R&D)*

> *"One speaks the same language, has a sip of beer in the evening, and that's how the whole thing runs much better […]" (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)*

> *"They [project managers] will manage themselves daft and silly if inhibitions are built up between individuals or individual groups."*
> *(Georg Häh-nlein - Project Coordinator of Phases I, II & III, DLR)*

"One does these social things along the way, they are not provided in the project plan and it is just courteous to come together in the evening for a beer or to eat something." (Andreas Udovic – Project Engineer of DFS, In-stitute for R&D)

"These informal contacts are generally important within the project, which ensure reasonable operation." (Jörg Meyer - Point-of-contact Phase III, EADS - Military Air Systems, Flight Management & FCS System Design)

4.3.2.2. Keeping distributed work progressing through routine meetings

To keep the work progressing between distributed project partners, regular face-to-face meetings are carried out at two to three month intervals. All the interviewees stated that the face-to-face meetings are absolutely indispensable for successful progression. They strengthen social relations and make the coordination of project matters run more smoothly.

"[…] without personal contact, if that has never ever happened, it is nearly impossible." (Dr. Peter Stütz - ESG-internal project man-ager Phases I&II, point-of-contact Phase III, Institute for Simulation & Training ESG)

"However, I must say, these things [team success, motivating one another], they don't happen in the virtual world. It is rather often the case that you have to sit next to someone. You have to really see how he 'swims'. If I tell him something now, will he be disappointed, or if I tell him in a different way, will he follow me in that moment? And that one

doesn't find out via the common media, like telephone, internet etc. It just doesn't work there." (Dr. Peter Stütz - ESG-internal project manager Phases I&II, point-of-contact Phase III, Institute for Simulation & Training ESG)

In between regular face-to-face meetings, regular status follow-up between the project manager and points-of-contact are also carried out to ensure the achievement of the milestones. Often it is too late to intervene shortly before a milestone is due.

"If a milestone is supposed to be achieved somewhere, a report has to be constructed. That means sending an email, phoning again, asking for confirmation, for example, because often one doesn't know if it suits him or what?! One has to always push and control if something is happening there; that is very, very important. My experience states that they all tend to be rather inert and have frequently got other stuff to do than just working on this project." (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

The status tracking routine not only helps to keep the project on the right track at all times but also supports the team in identifying problems at an early stage.

"We are anxious that the phases between the actual status tracking do not become too large, because the danger that we 'over-concentrate' ourselves on a particular path which is not shared with other partners, is simply too great. That is of course a big problem for us; therefore it is in our interest to identify problems at an early stage." (Jörg Meyer - Point-of-contact Phase III, EADS - Military Air Systems, Flight Management & FCS System Design)

The strategy of tackling the project's challenges in a step-by-step plan was applied throughout the course of the project. According to the project manager of the phases II & III, who is also quoted below, it does not make sense to undertake two or three big leaps at the same time. He suggests instead taking many small steps, one by one, and hence the WASLA-HALE project does not consist of one big phase and one long time-span of eight years, but rather of three phases which are once again divided into a number of milestones. He also commented that this step-by-step strategy is implemented in all levels of the project, and throughout all three phase projects.

> *"[…] the next goals one can approach in the following phases, and these phases should also not be too long, so not, for instance, five-year phases. One should always run through an evaluation process in small steps and several phases. And finally the planning of all of that is very important, combined with the experience which is included in the planning. A lot of the experience already results out of the prior phases themselves and supports in planning the next phase, which will then lead to a higher probability of success." (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)*

4.3.2.3. Other emerging routinised behaviours

Procedures for the exact exchange, commenting and sharing of documents by all project partners are handled in a routine-like manner, arising out of past experience. Due to past experience there are no specific written rules and regulations on how to go about the document exchange and sharing; instead an approved way and routine has developed: for document exchange (especially re-worked documents) communication via email is predominant; for smaller questions or points of clarification telephone communication

is used, and for publicising or sharing the newest information and documents a DLR based intranet server hosts a project team site which is looked after by the project manager. Members log in to the server at need and therefore notification emails informing them about new documents and/or information on the server do not exist. There is no tracking of number of emails per week or month, used for status tracking for example, either.

If an individual wants to re-work a document he or she downloads the document from the server, reengineers it accordingly and sends it to the project manager, who archives it on the server afresh. If documents, containing information regarding more than one project partner have to be revised, these documents are at first exchanged and where needed altered and then sent to the project manager once again to be published on the server. This chain of activities has become a routine, originating out of past experience:

> *"[…] this procedure has just proved its worth." (Andreas Udovic – Project Engineer of DFS, Institute for R&D)*

> *"[…] respecting the documentation structure, I say once more, it was basically just done out of past experience in collaboration with the DLR. The way of doing, how that (the documentation) typically runs, was very much affected by experience." (Dr. Peter Stütz - ESG-internal project man-ager Phases I&II, point-of-contact Phase III, Institute for Simulation & Training ESG)*

4.3.2.4. Successful network organisation projects and next steps

Overall the WASLA-HALE projects proved to be an exceedingly positive endeavour, receiving very affirmative feedback from its own team members right across the board.

"[partners isolating themselves or walling themselves in]... That has NEVER happened in WASLA-HALE!" (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

"[…] we then actually came very, very far in different areas, we reached those things which we actually wanted to demonstrate – even exceeding that. And that is the reason why it was so successful."(Dr. Peter Stütz - ESG-internal project manager Phases I&II, point-of-contact Phase III, Institute for Simulation & Training ESG)

"I haven't got any problems with the project. At the moment I have got the feeling that everything is advancing." (Andreas Udovic – Project Engineer of DFS, Institute for R&D)

"[…] this is one of the best projects in which I ever took part, in respect of coordination, result, budget and time planning"(Georg Hähnlein - Project Coordinator of Phases I, II & III, DLR)

5. CASE ANALYSIS AND DISCUSSION OF RESULTS

In chapter 4, three different network cases were presented. The first, ESoCE-NET, tries to build a network on concurrent enterprising, through organising annual conference events. The second, ARC, tries to establish a network of European wide roadside assistance services. The third, the WASLA-HALE programme, regarded a network of aeronautic firms who planned to build the first European unmanned aircraft.

Despite the differences, all three cases provide interesting findings on how routinisations take place in network organisations. The first two cases, ESoCE-NET and ARC, are relatively "young" networks when compared to the aeronautic network case of WASLA-HALE. Therefore different cases could also provide different views on what routinisation means to different maturity stages of network organisations.

In terms theoretical analysis of the cases, as discussed in chapter 2 of this thesis, so far there are no studies on routinisation at the level of network organisations, and hence lack of concept and framework for further understanding. Therefore, a grounded theory approach has been adopted, but with Giddens structuration framework as the initial guidance for analysis. Based on Giddens structuration framework, I have argued in section 2.7.4 that routinisation is the interaction process between network partner firms' actions, the modalities and the structures which are sets of routines.

Therefore the focus of this chapter is to analyse and discuss these three different network cases first according to Gddens' framework, and then also reflecting on existing routinisation-related concepts and theories developed and applied to the

understanding of routinisation in a single firm, as discussed in chapter 2. The aim is to therefore contribute to overall theoretical understandings on routinisation.

5.1. GENERAL CASE BACKGROUND ANALYSIS

All three network organisation cases have more than 10 years of history, but the results have shown different degrees of routinisation. Table 27 shows that each of the different network organisations has different collaboration natures. For example, ESoCE-NET started as a small group of voluntary network firms, and ARC network also started with a small group of eight firms (or clubs), but in the latter case the incentive was strategic crisis. Finally, the network case of WASLA-HALE is group of firms which have a long history of past collaboration.

Case characteristic	ESoCE-NET	ARC	WASLA-HALE
Network age	Since 1991	Since 1990	More than 20 years
No. of active partner firms	> 9	> 8	> 6
Network-wide firms	> 40	> 38	N.A.
Nature / Structure	• Voluntary • Service offering • Flat hierarchy	• Strategic alliance • Service offering • Flat hierarchy	• Industrial network • R&D • Main contractor, but flat hierarchy
Longitudinal data availability	1991-2006	1990-2002	2000-2006
Nos. of network projects studied	15	3	3

Table 27: Characteristics of the case networks

From the analysis, more active routinisation-oriented activities were observed in the ESoCE-NET network, when compares with other two networks (Table 28).

Case	Routines
ESoCE-NET	• Paper submission and reviewing routine • Organising committee meeting routines • Marketing routines – call for papers & final programme • Annual conference organising team formation routine • New annual conference champion selection and coaching routines • Change of annual conference days' programme planning • Annual strategic meeting routine • Constantly introduction of new IT technology routine
ARC	• Ongoing introduction of network collaborative projects or service product routines • Regular IT manager/Business manager idea exchange meeting routines (every six months) • Ongoing introduction of IT technology routine • Milestone planning routine • Change plan/ milestone routine • Regular progress meeting routine
WASLA-HALE	• Milestone planning routine • Change plan/milestone routine • Regular progress meeting routine • Document sharing and exchange routine • Ongoing introduction of IT technology

Table 28: Routine activities observed in the three different network cases

Nevertheless, from the maturity point of view, the WASLA-HALE network is the one that has the most mature collaboration experiences, and stable routines.

"All the interfaces between the partners are basically already aligned, from past experiences; all of that mustn't be defined from scratch again." (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

The ARC network seems to first face several defensive routines, such as language problems, different cultural backgrounds and lack of interest and commitment to collaborate.

"Different people have different working culture, and their organisation priority, so it is quite difficult to push things in the way we want it to be." (Graham Warner—Project manager of Phase I and IS General Manager of AA Membership until 1994)

"I don't think communication is good, there wasn't a proper strategy in place. There is also not enough integration for working together, certainly not keeping users involved throughout the process [...]" (Tim Weston - Business Assistance Analys,t AA)

Finally the ESoCE-NET network has more open and motivated partner firms. However, the environment is more dynamic and constant changes are required.

"Everybody shared some responsibility to some degree. Everybody does those things which he can do the best; that was probably the best thing in the conference." (Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)

"It is nice to have clearly devoted processes, but it is not something too stable in environment, because things change so rapidly." (Kulwant

Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)

Form the perspective of network age, both ESoCE-NET and ARC networks are established in almost the same period of time, but ESoCE-NET has more established collaboration routines when compared to ARC. Therefore I would conclude that a more open and motivated partnership in the networks provides a better environment for potential routinisation.

5.2. A NEW THEORETICAL UNDERSTANDING OF ROUTINISATION IN NETWORK ORGANISATIONS

The main contribution of this study is to provide the first theoretical explanation on how routinisations are enabled in the context of network organisations, which often start without any commonly shared interaction structures, social relationships or management structure. To achieve this objective, this theoretical discussions chapter aims to re-conceptualise existing routinisation concepts which are based on a single firm setting, for better understanding of routinisation in network organisations.

5.2.1 Structuration argument of routinisation in network organisations

Giddens' structuration framework is derived from the concept of routinisation in one single social community, and explains that social structures and routines are outcomes of ongoing interactions of agents and vice versa.

> *"The concept of routinisation, as grounded in practical consciousness, is vital to the theory of structuration." (Giddens, 1984)*

However, in the context of network organisations, the interactions are between multiple firms rather than within one single firm. Therefore, based on case results in chapter 4,

Gidden's framework has been reconceptualised to reflect the actual context of network organisations, and several new understandings of routinisation in network organisations have been observed.

Sets of routines	Structure	Signification	Domination	Legitimation
Mechanisms enable routinisation	**Modality**	Interpretive Schemes	Facilities	Norms
Network project firms	**Human action**	Communication	Power	Sanction
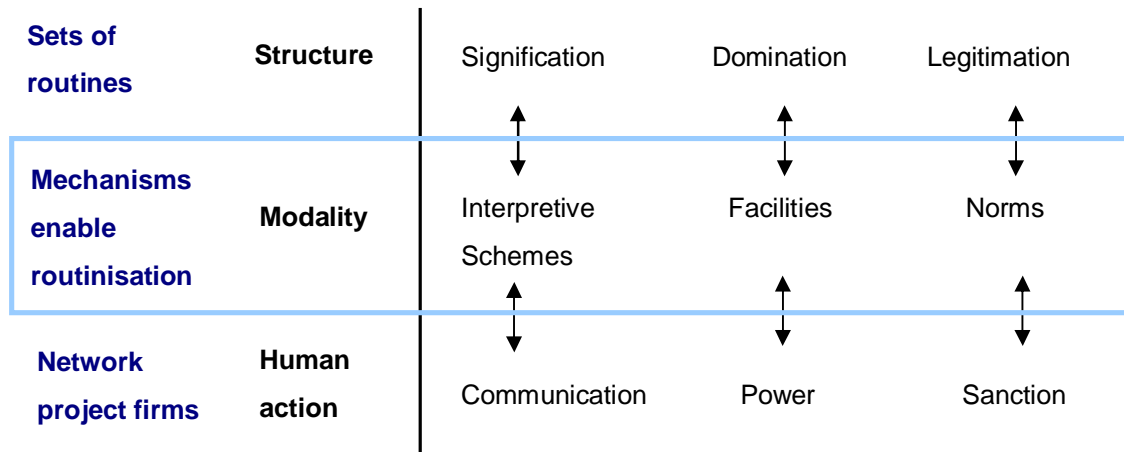
Figure 36: Analysis constructs for network organisations' routinisation

- **Significant - Interpretative Schemes – Communication:**

Generic professional interpretative schemes are observed in all three cases as the very first step when firms start to engage and interact with each other without any defensive attitudes. This is directly in-line with Giddens' structuration framework, which states that that human agent communication is based on sets of common interpretive schemes. For example in the case of ESoCE-NET, soon after the decision to organise a European conference on concurrent enterprising, several generic conference organising schemes were introduced to moderate the interactions between the partner firms. However, most of these schemes were modified later on to better fit with the context of the network.

> *"Before '97 it was semi-commercial. They tried to attract more practitioners but not too many academics, because the workshops in '94 and '95 were simply presentations […] during the '97 conference, for the*

very first time a call for papers was introduced." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)

In the case of ARC, since the decision to establish a pan-European roadside assistance network, a common pan-European B2B contract has been introduced as a common interaction scheme. Despite the common pan-European B2B contact, the case also shows that without a common understanding and agreement of the global generic business processes, there will be no chance to further develop any integrative schemes to support interactions between the firms in the network.

"However, data standard definition quickly ran into difficulties. It was almost impossible to define standard terms for different services that were provided by different clubs, and which required different specific skills or resources that were not available, sometimes not even known within all clubs." (Graham Warner - Project manager of phase I and IT General Manager of AA Membership until 1994)

"Within the project team we developed a business process model. We probably had more than twenty versions. It was not anywhere near perfect and we did have a lot of problems with compromising the business process, because there is no such thing as the one and only business process. So, we actually did compromise quite a lot."(Graham Warner - Project manager of phase I and IT General Manager of AA Membership until 1994)

In the case of WASLA-HALE, mature professional standards and past experiences in the similar area of development projects have been shown to provide a good starting point for the firms to collaborate in complex network projects.

> *"The quasi-routines all result from a lot of experience. Experience with partners, experience with the contents of the project and with the experiment participators inherently."* (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

> *"All the interfaces between the partners are basically already aligned, from past experiences; all of that mustn't be defined from scratch again."* (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

Therefore we can conclude that routinisation in network organisations starts with generic professional interpretative schemes.

- **Domination – Facilities – Power:**

In firms, routines are often developed based on the inherent hierarchical structure. Therefore the creation and change of routines depends on the decisions or actions of one or two persons in authority (Becker et al., 2005). Nevertheless, in all three network organisation cases studied here, instead of dominant power and hierarchy oriented interactions, self-responsibilities and share of resources are the prominent ways in which firms interact. In the case of ESoCE-NET, all the participating firms are regarding as equal, and interact based on roles and responsibilities.

> *"Everybody shared some responsibility to some degree. Everybody did those things which he could do best. That was probably the best thing in*

the conference." (Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)

In the case of WASLA-HALE, a contractor and sub-contractors' relationship is maintained between the network partner firms. Despite this hierarchical relationship, the actual interactions between partners firms are very much peer-to-peer based with clear acceptance of responsibility throughout.

> *"Well, we have tried to keep the whole thing in a very narrow hierarchy or in a shallow hierarchy. That ran very well, because the responsibility therefore lay with the people themselves." (Georg Hähnlein - Project Coordinator of Phases I, II & III, DLR)*

> *"We knew the whole setting. I would not have come up with the idea to approach anyone else in a hierarchical manner." (Dr. Peter Stütz - ESG-internal project manager Phases I&II, point-of-contact Phase III, Institute for Simulation & Training ESG)*

In the ARC case, although different partner firms have different percentages of share holding, shared dominances were observed between the different partner firms. Joint share of resources and responsibilities has been claimed as the way to further the development of the network.

> *"We use all the resources from different clubs, and each has certain degrees of influence in different areas. As you would expect, this influence will depend partly on their share holding, and partly on their size and market strength. The three largest clubs have the most influence, but it doesn't operate with enormous ill well from other clubs, because they do*

see the benefits from this interchange and support." (Andrew Johnson –

Chief Executive ARC Transistance)

"ARC did welcome everyone to send their people to work in ARC. But for

the smaller clubs like us, that only have one person in charge of the whole

operation, it is difficult to send people to ARC." (Belén Yome - Assistance

Centre Manager of RACE and Senior User)

Therefore, downplaying hierarchy, and actively sharing and exchanging resources are the preconditions for routinisation in network organisations. By referring to Giddens' (1984) structuration framework, we could conclude that in network organisations dominance is an outcome of contribution of resources (facilities), and power is exercised based on competence leadership, instead of hierarchy or contractual dominance, and under these conditions routinisations are more likely to occur.

- **Legitimation-Norms-Sanction:**

Coordination is inherent in the nature of routine (Hage et al., 1969; Volberda, 1998). Active mutual coordination and engagement of partner firms has been pointed out as one of the first critical steps for joint interactions, and hence routinisation. For example in the case of ESoCE-NET, an annual local organising champion will be identified and taking the lead in coordinating different stakeholders to contribute to the overall organising of the conference.

"So having a champion to sit in the driving seat is very important.

Traditionally we think it is important to look for local person to be the

champion." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising

committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)

In the case of ARC, a dedicated coordination office has been established to not only provide pan-European roadside assistance contracts, but also initiate discussions, projects and products for the different partner firms (clubs) to work together and potentially establish common working routines.

> *"ARC is not a club itself; ARC is a coordination body for the clubs."*
> *(Volker Knapp - Chairman of the Board of ARC)*

> *"ARC Brussels is a coordination office to us. ARC should try to coordinate the issues that have to be done all together […] we have gained a lot now in Brussels, because we have a coordinator in Brussels[…] he comes from the assistance side, things become easier, because he understands what the problems are, and really pushes everyone to bring something forward and discuss." (Belén Yome - Assistance Centre Manager of RACE and Senior User)*

Nevertheless this is only the very first step. There are many challenges that still need to be overcome.

> *"However there are still some clubs which don't want to change the way they are working now." (Belén Yome - Assistance Centre Manager of RACE and Senior User)*

Similarly, in the WASLA-HALE case, a small group of point-of-contact persons from each partner firm have been selected to facilitate the interactions between firms and within individual firms.

"[…] each firm had officially one point of contact, and in each individual firm there was then three or four people. Thus there are approximately 12 to 16 people, although in the background there are still more, which still works effectively." (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

Therefore by referring back to Giddens' structuration framework, this common mutual coordinator/facilitator role is replacing traditional norms or sanction actions for engaging different stakeholders to different joint actions and responsibilities, leading to routinisation of joint actions.

5.2.2 Learning perspective of routinisation in network organisations

In section 2.7.3 learning has been identified as a firm dynamic capability to drive ongoing routinisation of its operation, in order to react to environmental changes. Nevertheless, learning in network organisations takes long period of time, and only becomes effective when trust is established. For example in ARC network, different shareholder clubs are long-established and have their own routines, which are difficult to change and accommodate with others. In addition, different national cultures have also hindered the process of learning.

"The major shareholder clubs of ARC are generally long established, and successful organisations, and have often built their own operation systems, trained their own staff and developed their own operation methods in the way that suits their own market needs."(Andrew Johnson – Chief Executive ARC Transistance)

> *"You need time to work together and to understand how to find a solution […] One point is culture, German – direct, English – polite, Spanish – any way to make the meeting. Different nations, different ways to find solutions, the understanding is not so clear. Members of project boards have to learn firstly how they can work with each other." (Dietrich Heide – Managing director of the ADAC service company and Senior User)*

To overcome these different working routines in different clubs, the ARC coordination office has tried to induce different joint development activities, for example the Telematic project, ARCIP and ARC TIME interoperability project, and show-your-card programme.

> *"It is very difficult to work in ARC, because the organization has grown so much in 10 years. Last year we found the way to work together, to work together with the same attitude of working, same idea. At moment I see growing trust, and I see the people who are responsible for the ARC development have more power and energy […] We are in a good way, we need more people to have the feeling of belonging to ARC, treat ARC as a part their own clubs." (Dietrich Heide – Managing director of the ADAC service company and Senior User)*

In the case of WASLA-HALE significant past experiences of working together have helped to established good common interaction routines which are critical for effective joint working.

> *"The quasi-routines all result from a lot of experience. Experience with partners, experience with the contents of the project and with the experiment participators inherently […] All the interfaces between the*

partners are basically already aligned, from past experiences; all of that mustn't be defined from scratch again." (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

Similarly in the ESoCE-NET case, an organising committee team was created, to provide the know-how transfer to each year's new conference organising champions.

"It has been a real collaborative work with the organising committee […] Basically there is a strong input from the organising committee in ICE 2000." (Olivier Roelle, ICE 2000 Local Organiser, ADEPA, France)

To further facilitate know-how transfer, an organising handbook was also created, but because of ongoing changes in the organising routines, it has never been formally accepted. In addition, prior the start of each year's conference, an organising committee meeting is held to reflect on the lessons learned from the annual conference organising.

"There are some experiences to transfer. I still have the draft of the handbook. We also tried to bring things together […] there are always some changes, the processes were not stable." (Klaus-Dieter Thoben, Co-Founder of ESoCE-NET, ICE 2001 local organiser, BIBA, University of Bremen, Germany)

These findings are also in line with (Argyris, 1976)'s double loop learning, that learning is a way to question and change the fundamental designs, goals and activities in a firm, rather than just learn to perform; as opposed to (Zollo et al., 2002)'s single-loop of learning. Thus it is iterative and changes continuously. Nevertheless, there are still some differences in network organisations. Routinisation through learning usually takes place across different projects, instead of ongoing operations in single firms.

5.2.3 Change perspective of routinisation in network organisations

In (Feldman, 2000; Feldman et al., 2003)'s routine change concept, routines are not static actions; rather they are constantly changing. Therefore routinisation is an outcome of continuous reflection on the previous experiences or introduction of new ideas.

In network organisations, routinisations (or routine changes) are more likely to occur and be accepted by the different stakeholders in the network when risks arise. Routinisations (or routine changes) caused by reflection on the previous experiences or introduction of new ideas, however, often take a relatively long period of time before being accepted. For example in the ESoCE-NET case, a regular two-week organising committee meeting routine was quickly introduced in 2001, when the committee members felt that there were problems with the local conference organising. In another instance, clear responsibility was assigned when the organising team realised the importance of this for reducing the risk of conference organising in the 1999 conference.

> *"The idea of clearly assigned responsibility came out in the Huage, as we learnt it doesn't work if someone is taking on all the risks; we need to share the work." (Klaus-Dieter Thoben, Co-Founder of ESoCE-NET, ICE 2001 local organiser, BIBA, University of Bremen, Germany)*

> *"We also had regular or irregular meetings. When we were concerned about Helsinki, we introduced regular teleconference for every two weeks. This was when it is in critical phase. Otherwise there was little responsibility for the organising committee." (Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)*

In the ARC cases, the different national clubs quickly came together and collaborated on the pan-European B2B contracts offering, because of the radical change in the industry when motor manufacturers entered the market of roadside assistance in an attempt to retain a relationship with their customers throughout the lifecycle of the car. Similarly, soon after the first phase of the ARC IT system development, there were several change mechanisms introduced to change routines which were not applicable to the situation.

> *"[…] we changed structure, we introduced change management, we introduced quality review, we introduced a stage manager to be accountable. Things did change as we went from early stage to […]"(Gaynor Clarke of the AA – ARCIP Project Manager 1997-2000)*

In addition, from the ESoCE-Net case, I further observed that routinisations caused by reflection on previous experiences or introduction of new ideas are often initiated by the persons who has the responsibilities for the routines.

> *"One change with Klaus-Dieter in particular is the paper reviewing process, and the whole process, call for papers […] For the paper reviewing process, I myself have contributed quite a lot to formalising the process […]"(Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)*

In the case of WASLA-HALE there are no direct changes in routines during the study, except change of milestone planning when risks or delays occurred. This might be due to the fact that the WASLA-HALE network has been established for longer than the other two networks.

Therefore we can conclude that routinisation (or routine changes) is more likely to occur and be accepted when risks are arise, and that learning to change or accept the introduction of new ideas often takes longer, depending on the motivation of the responsible person(s).

5.3. A NETWORK ROUTINISATION PROCESS

In this section, the discussion focuses on the process of routinisation that takes a relatively long period of time to evolve and develop in network organisations. For the purpose of presenting the longitudinal nature of the routinisation process, the process is described in several sequential stages. The outcome of this section is to contribute to the practical knowledge on routinisation in network organisations.

- **Stage 1 – Understanding : Pursuing common strategic interests triggers routinisation between networking firms**

From the results of the three study cases, I suggest that routinisation between networking firms is triggered by the high motivation or pressure to purse a common strategic interest. In the case of ARC, during early 1990s, a radical change in the industry occurred when manufactures entered the market of roadside assistance in the attempt to retain a relationship with their customers throughout the lifecycle of the car. In response to this pressure, eight of the main European national clubs, which prior to the 1990s offered roadside assistance to their members independently, decided to come together and jointly create and offer pan-European B2B service contracts to the different national automobile manufactures. Because of this common strategic interest, the different clubs started to develop standard service routines (routinisation) which aimed to harmonise the different standard service quality offerings from different national clubs.

Slightly different from the ARC case, in the ESoCE-NET case common strategic interest to create the first pan-European network in concurrent enterprising was the main driver to trigger the routine of annual concurrent enterprising conference organising. Despite the high motivation of the initial involved partner firms, several key conference operational routines only slowly started to evolve and develop.

Similarly to the ESoCE-NET case, in the WASLA-HALE case the common strategic interest (to identify technology requirements for first European unmanned flying vehicle) was the driver for initiating the program. However, in this case, because of the long-term collaboration experiences between the different partner firms, sets of commonly shared collaboration routines were already in place prior the start of the program. Therefore the different firms within the network, which have different competences, can quickly assemble to tackle this highly complex issue.

These outcomes are directly in line with (Gersick et al., 1990)'s argument that routinisations are often triggered when encountering a novel state of affairs or receiving an intervention from the external environment. Similarly (Naduzzo et al., 2000) have also pointed out routinisations only occur when during the starting phase of a new firm.

- **Stage 2 – Structuring : Defining basic interpretive schemes and management structure for fostering routinisation**

In the second stage, all the networks studied have established a network coordination entity that consists of the senior representatives from all the networking firms, to address the common strategic interest. For example, the organising committee in the ESoCE-NET case, the ARC Brussels office in the ARC case, and the programme coordination team (consisting of a key point-of-contact from each partner firm) for

WASLA-HALE case. In addition, different roles and responsibilities were identified according to the competences of the different firms in the network.

One of the early steps that is defined by this coordination entity is to commonly agree interpretative schemes and communication structure, which then enables the different networking firms to start interacting, and hence enables routinisation. This is also directly in line with (Giddens, 1984)'s structuration framework, that the interpretative scheme helps to define the structure and basic human communication interactions. In the case of ESoCE-NET, the first organising team was created three years after the first workshop. The organising team defined that the conference should be organised annually in different European cities with local partner firms in charge of the local logistics. In addition, the conference was also positioned as a semi-academic and semi-industry conference. Under this scheme, several routines have been defined, for example searching for local partners, paper reviewing routine and call for papers routine, all requiring different roles and responsibilities.

Similarly, in the case of ARC, a European coordination office has been established in Brussels to coordinate the communication and definition of the common interaction schemes. The pan-European B2B service contract is the first network interaction scheme. Under this scheme the service standards of the different clubs have to be harmonised to a common and unique standard.

In the WASLA-HALE case, as already mentioned in stage 1, because of the past experiences of working together on similar technical development projects, the schemes for interactions and communication are very much inherited from the past.

However, these schemes and defined roles and responsibilities are only the basic mechanisms for fostering further routinisations between the networking firms, and the

main challenge for the network organisation management is how to overcome the culture differences and defensive behaviours, and hence engage different networking firms to develop commonly shared routines. As one of the senior operation managers in the ARC case said:

> *"You need time to work together and to understand how to find a solution […] One point is culture, German – direct, English – polite, Spanish – any way to make the meeting. Different nations, different ways to find solutions, the understanding is not so clear. Members of the project board have to learn firstly how they can work with each other." (Dietrich Heide – Managing director of the ADAC Service Company and Senior User)*

- **Stage 3 – Improving : Learning to work together through ongoing joint activities and informal social relationship development**

In the third stage, routinisations start to emerge when trust starts to be established between the different networking firms, and hence they are more willing to share and exchange of ideas and thoughts. According to (Giddens, 1984)'s structuration theory, human interactions are the starting point for any further routinisation activities or behaviours. Informal social relationships have been identified in all the different cases as the way to break the defensive behaviours between partner firms in network projects. For example, in the case of ARC, through different project meetings and network events, some of the firms' representatives have admitted that getting to know people in person helped to better establish common ways of working together.

> *"The relationship between the clubs did improve, because you do see the same people in every meeting and that helps a lot, i.e. the relationship between the AA and RACE is better than before, when compared to three*

years ago. Me and Jean (AA, European operation) have been together in many workshops and work together in many things, exchange of operators." (Belén Yome - Assistance Centre Manager of RACE and Senior User)

Similarly in the case of WASLA-HALE, social activities like informal drinks have also been pointed to as an important factor to ensure effective interactions between the partner firms.

"These informal contacts are generally important within the project, which ensure reasonable operation." (Jörg Meyer - Point-of-contact Phase III, EADS - Military Air Systems, Flight Management & FCS System Design)

"One speaks the same language has a sip of beer in the evening, and that's how the whole thing runs much better […]" (Dietrich Altenkirch – Project Manager of Phases II+III, DLR Institute of Flight Systems)

Finally for the ESoCE-NET case, dinner in the evening after meetings and long-term personal contacts have also been identified as important assets for successful organising of the conferences in the past 14 years. Therefore trust is strong among the organising team.

"There were teleconferences and face-to-face meetings which were held one day before the conference. There were also some occasions where larger groups came together, but sometimes there was only part of the group that made decisions, and discussed issues directly. And since we all

trust each other that was fine." (Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)

Besides having the basic trust that helps to engage people to discuss and exchange of ideas, concrete joint project activities are also important mechanisms to change routines and develop new ones that are jointly shared between the different networking firms.

- **Stage 4 – Changing : New ideas and risks force old routines to be changed and hence new ones emerge**

In the fourth stage, new ideas and risks that occurred through the joint project activities forced the networking firms to change their own routines and develop new ones shared by most of the networking firms. Once the firms in the network start to engage in open discussion and exchange of know-how, mechanisms like regular strategic review meetings and risk/change management become essential in managing the upcoming requirement to change the routines. For example in the case of ARC, every year all the senior operation people and CEOs meet together to discuss about the development of the ARCIP & ARC TIME projects. The decisions to change the project management approach and new IT architecture for the second phase after the ARCIP project are just two examples of major routine changes.

Similarly in the ESoCE-NET case the organising committee meet one day before the start of the annual conference to go through the lessons learnt from the previous year and make changes to the routines. The decision not to send any further calls for papers via post, and to change the paper review from abstract to full paper, were two good examples of routine changes in the ESoCE-NET case.

As discussed in section 5.2.3 of this chapter, risks are the main drivers for fast routine changes in network organisations, while the routine changes due to learning are

sometimes more difficult to realise in network organisations. In the case of the ARC network, more defensive attitudes were observed. For example, it was suggested that a joint IT system could reduce costs of redundant development in each club. Nevertheless, the senior operation people seem to be behaving defensively with regard to this new idea.

> *"To us it is very important, because we have a combined office in Lyon,... However, having different IT systems operated by different clubs, the integration in Lyon was not easy." (Jan Barkhof – Vice Chairmen of ANWB Executive Committee, and Chairmen of ARCIP project board until 1998)*

> *"To get a further investment, we need a quite sound business case, so from our perspective unless it shows significant improvement on time for processes and quality there is no clear reason for us to invest, because we are quite happy with our existing systems [...] So we need to wait and see what it is going to be delivered, and see if there is any significant improvement to justify a business case." (Jean Pocock - European Operation Manager of AA and Senior User)*

> *"We have to see who is going to use the system, and where they are going to implement the system; then we will decide whether it makes sense for us to participate."(Belén Yome - Assistance Centre Manager of RACE and Senior User)*

In the case of ESoCE-NET, because of the high trust, and more openness between the organising team members, several new routines were introduced by different years' conference champions (Table 17), despite some cultural diversity between the firms.

> *"There were significant differences in meeting styles and behaviours of committee members. Robert and Marc have Italian and French ways of organising. Klaus-Dieter and I are very German. So in the end no one was really responsible. Nobody was responsible, but al werel responsible. Everybody shared some responsibility to some degree. Everybody did those things which he could do the best; that was probably the best thing in the conference."(Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)*

- **Stage 5 – Automating : IT is shaping the process of routinisation**

In stage 5, IT has played an important role in shaping the routines in network organisations. This is directly in line with (Orlikowski et al., 1995)'s argument that: IT has played a vital role not only in shaping the interaction of people in firms, but also influencing the firms' structures. In the case of ESoCE-NET, different communication IT technologies have been introduced. This really changes the routines of meetings between the distributed partner firms. For example face-to-face meetings were first replaced by teleconferencing, which allowed faster reaction to risks.

> *"We spent a lot time visiting Signal, but in the end they pulled out. So they couldn't do it. Then Klaus-Dieter and I went to see Neil Wagmen at University Twente, and convinced her to take a lead in it." (Kulwant Pawar, Co-Founder of ESoCE-NET, organising committee chair 1997-2004, ICE 1997 local organiser, University of Nottingham, UK)*

> *"We also have regular or irregular meetings. When we were concerned about Helsinki, then we introduced a regular teleconference every two weeks. This was when it is in critical phase." (Firthjof Weber, ICE 2001 local organiser, Airbus, Germany)*

Later on a peer-to-peer oriented and cost-free technology, Skype, was also brought in, which further reduced the time spent in setting up and coordinating meetings.

In the case of WASLA-HALE, there are no specific written rules and regulations on how to go about the document exchange and sharing; instead an approved way and routine has developed over the years from past experience: for document exchange (especially over-worked documents) communication via email is predominant; for smaller questions or points of clarification telephone communication is used; and for publicising or sharing the newest information and documents a DLR-based intranet server hosts a project team site which is looked after by the project manager. The number of times someone logs in is based on personal responsibility necessity; therefore notification emails informing the members about new documents and/or information on the server are not required.

In the case of ARC, considerable effort has been spent on trying to routinise the network operation, through two large-scale interoperable IT system projects. Although it will still take some years before the systems are accepted by most of the firms in the network, commonly agreed global business routines have been defined and implemented within the developing system.

> *"Within the project team we developed a business process model. We probably have more than twenty versions. It was not anywhere near perfect and we did have a lot of problems with compromising the business*

process, because there is no such thing as the one and only business process. So, we actually did compromise quite a lot."(Graham Warner - Project manager of phase I and IT General Manager of AA Membership until 1994)
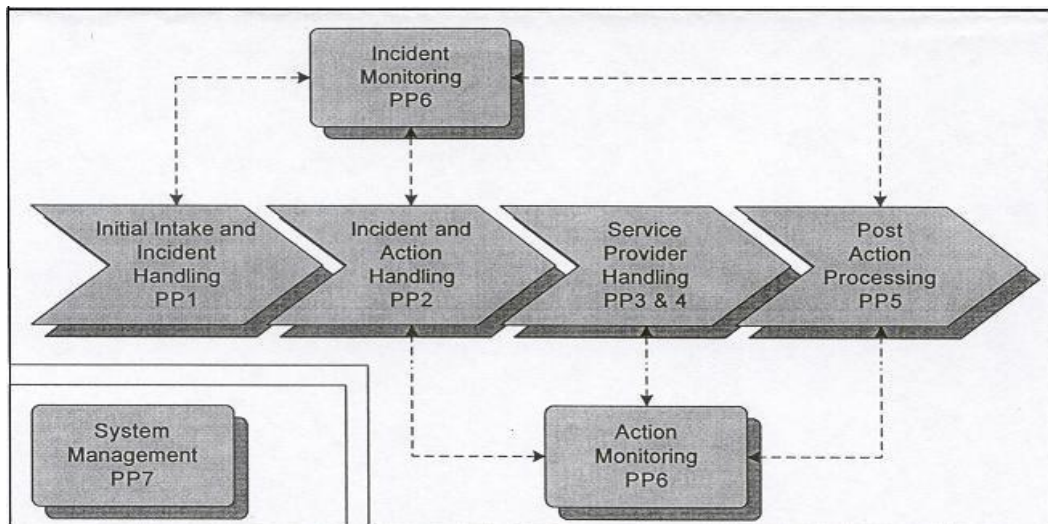
Figure 37: Main Business Process of ARCIP Project

Therefore this stage could occur in parallel with the stage 4, since IT has also become an important interpretative scheme for communication between the distributed firms in the network.

5.4. CONTIRBUTIONS TO EXISITIN RESEARCHES ON NETWORK AND ROUTINISATION

The study contributes in a number of ways to the literature on networks and routinisation. First, the study contributes to existing research on networks, not only by focusing for the first time on development of network routines (routinisation) but by demonstrating that routinisation is critical for understanding of networks' evolution. The five different stages of routinisation in networks, as shown in section 5.3, have provided the initial basis for further researches on routinisation in networks.

Second, the finding suggest that routinisation in network organisations is a complex process of social structuration that triggers further organisational learning and change between the networking firms, which turns common strategic interests into results. This is very much in line with the basic argument of Giddens's (1984) structuration theory, but takes into the consideration the complex relations between culturally distinct firms that collaborate in a network.

Third, this study also extends existing structuration study on networks, by introducing a new study framework (Figure 12). Different constructs presented in the framework have been observed and identified through the three network cases, while in previous studies (Sydow et al., 1998) structuration theory was only used to explain the interaction between the agent and the network structure, but without concrete constructs being defined. Discussions on the different constructs in the new study framework have also been presented in sections 5.2 and 5.3 of this chapter.

Fourth, although hierarchy does exist in all three network cases, most of the interviewees have indicated that hierarchy is often downplayed, while increased communication to reach more mutual understanding and collaboration is more common in networks, and hence there is more chance for potential routinisation to occur.

Fifth, this study also contributes to growing empirical study on routine changes/ routinisation, by focusing on networks rather than single firms, which are more usually the focus in other current research. In contrast to other existing routinisation theoretical models, for example (Feldman, 2000)'s performative model of routinisation: ideals-plans-actions-outcomes, that focus more on the ongoing learning of a stable and single firm, routinisation in network organisations is heavily dependent on the maturity

of social relation between the network firms, or the degrees of risk, and then the willingness to learn and change.

Another contribution to existing research on routinisation is the five stages model of routinisation in network organisations. This new stage model provides insights as to which routinisation activities are most likely to occur across different phases of networks. For example initiation of routinisation often starts during the stage 3, when initial social contacts are established across firms in networks. Concrete events and activities like projects are often organised for learning. Nevertheless, one could argue that the different stages shown in section 5.3 only focus on the high level view of routinisation in network organisations, and there could be more sub-stages between each of the 5 main stages. To overcome this potential weakness, several operational mechanisms that drive routinisation have also been identified in Table 29. In total eight common types of mechanisms have been identified, and the corresponding approaches taken by each network case are also provided.

Sixth, the findings provide further evidence that IT technologies have played an important role in shaping the process of routinisation. This is directly in line with (Orlikowski et al., 1995)'s argument that: IT has played a vital role not only in shaping the interaction of people in firms, but also influencing the firms' structures.

Finally, another contribution of this study is multiple longitudinal network case studies. In the past researches on networks, the findings are often based on one single case, and therefore the results derived from the three case studies help to make the results more generalisable. Nevertheless, more longitudinal case studies are still needed to further enhance the generalisability of the results.

Mechanisms	ESoCE-NET	ARC	WASLA-HALE
Network coordination / facilitation team	An organising committee team has been established to provide support to the annual conference organising champion	• Establishment of ARC Brussels • Establishment of " go around" project team during phase II of ARCIP	Establishment of core coordination team with one representative per organisation (key-point-of-contact)
Engaging new members with clear and critical role	Every year one new local organising champion is identified who should take charge of organising the conference	In Phase I ANWB led the project and in Phase II ADAC took the lead.	Each partner firm had a clear assignment according to their core competence, and there was one point of contact in charge of the development within each firm.
Constant introduction of new collaborative activities	Each year the conference is organized in a different European country with a different local team	• Member benefit programs • Establishment of ACTA France • Telematic service • ARCIP joint IT development project • ARC TIME joint IT development project	• Program phase 1, 2, 3 • And other projects
Informal social events	Get-together dinner after meetings	Peer-to-peer personal contact through networking meetings	Informal drinks after meeting

Mechanisms	ESoCE-NET	ARC	WASLA-HALE
Regular strategic review meetings	Two days prior to the start of the conference – organising committee meeting	Every half year - project board member meeting	Meetings every 2-3 months
Risk / Change management	Regular teleconference / Skype meeting	Every six months project management board meeting	Project time and milestone plan with a sufficient amount of buffers
Establish standard collaboration template	• Paper review forms • Conference paper template	• Report template	• Report template
Constant introduction of IT	• Telephone conference / Skype for organising. committee meetings • Workflow system and ve-forum platform for paper review	• ARC Phase I & II systems Telematic system	• FTP server • Collaboration work spaces

Table 29: Summary of mechanisms that enable routinisation

6. SUMMARY AND CONCLUSIONS

6.1. REFLECTION ON INITIAL RESEARCH QUESTION

Referring back to the initial research questions, I intended to explore how routinisation could occur in network organisations, and what the driving mechanisms that enable routinisation are. Through designing and conducting longitudinal case studies on three network organisations I was able to identify the key process stages and mechanisms that enable routinisation in network organisations. Theoretically, I have operationalised Giddens' structuration framework as well as applying existing routinisation theories or concepts that are based on single firms, to back-up the results of this study. In addition, I was able to provide a generic view of how and when different mechanisms are required to enable routinisation. Summing up, this dissertation offers not only conditions from a theoretical perspective to better understand routinisation in network organisations, but also different practical stages and mechanisms which can be adopted by network managers. However to further generalise the findings, more empirical studies are still required.

6.2. CONTRIBUTIONS

The overall contribution of this research is to both theory and practice. I address these contributions in the following two subsections.

6.2.1 Theoretical contribution

The theoretical contribution of this research is threefold. The first aspect addresses the research design. Theoretical development on routinisation under a single firm setting has proved to be difficult to carry out, due to the multi-stakeholder involvement in

routines, and time dependent nature of routinisation process. To address these inherent difficulties to study routinisation in network organisations, I have chosen a longitudinal research design by closely examining different network projects in different time spans, which allows the dynamic interactions between the different stakeholders in network organisations to be captured across time. Thus, I am able to denote routinisation occuring in network organisations across different network projects.

To analyse and identify key process stages and mechanisms that influence and enable routinisation in network organisations, I operationalise an important social routinisation framework, namely structuration theory (Giddens, 1984). By identifying different constructs of the structuration framework, I am able to identify the basic conditions that are required for routinisation to occur in network organisations.

The third theoretical contribution is to make reflections on existing theory and concept development on routinisation under a single firm setting. Contemporary theoretical and conceptual developments on routinisation are mainly focussed on one single firm. Therefore, reflecting on these contemporary theories and concepts, with the results collected from network organisation level, will help to strengthen further theoretical developments in this domain.

6.2.2   Practical contribution

The key process stages and mechanisms identified through the three study cases offer different valuable inputs to network managers, corporate senior decision makers, network project managers, and others, such as collaboration tools software engineers.

6.2.2.1. Implications for network managers, corporate senior decision makers

The results may provide the network managers or corporate senior decision makers with an initial checklist on what should be done and what should be avoided when first entering a collaboration network. For example, competence-based leadership will be more effective than exercising power through dominating shareholding.

The research outcomes also provide real examples of managing and engaging network partner firms into joint routine development. Although the generic business processes or schemes allow the partner firms to first engage into communication, the lack of commonly share interaction routines will still limit the collaborations between the partner firms, because of inherent defensive behaviour.

Finally, the structuration understanding of routinisation can help the network manager or corporate senior decision makers to plan or schedule complex activities or projects, because without a proper experience of working together or commonly shared collaboration routine, complex activities or projects tend to fail during the early phase of a network organisations.

6.2.2.2. Implications for network project managers

From the results, routinisations often occur across different projects. Project managers will often be in charge of managing such network projects. This research effort provides a set of mechanisms which the project manager might be able to apply, and some indications of pitfalls that should be avoided. For example in the WASLA-HALE case, several project managers emphasised the importance of a flat structure, rather than a hierarchy, because everyone shares the same routines and behaviours. However, no

matter how good the relationship is between the project partners, social events will still help to increase trust and flexibility when risk occurs or changes of plan are required.

6.2.2.3. Implications for collaboration tools software engineers

The outcomes of this study will help collaboration tools software engineers to better understand the collaboration tool needs in different phase of a network organisation.

Secondly, the development and design of the collaboration tools, should take into consideration the ongoing learning effects of the network firms. For example in the case of ARC, the interoperability system couldn't be realised because of a lack of trust and common understanding, which might be built up gradually through routine collaboration.

6.3. LIMITATIONS OF THE STUDY

Although this study offers various insights to both academics and practitioners, it also has some limitations. Despite rich longitudinal data being accessible for both ESoCE-NET and ARC cases during the time of the study, routinisation takes a long period of time to observe and study. Therefore, there might be some conditions or mechanisms which were not identifiable over the course of this study.

Second, the possibility of generalising the results for all network organisations is limited. Although several conditions and mechanisms were identified across all three study cases, the sample sizes are still not significant enough to generalise these findings. However, it is difficult to get access to longitudinal cases on routinisation in network organisations, which makes it hard to obtain a statistically significant sample.

6.4. DIRECTIONS FOR FUTURE RESEARCH

Because the focus of this study is to explore how routinisation could occur in network organisations, the focus of the results is to identify conditions that enable routinisation in network organisations, and not on the cause-effect relationship between the different conditions identified. Therefore to further validate these conditions, future studies could apply qualitative research designs to test the cause-effect relationships between the different conditions that have been explored here.

Another research recommendation is to conduct more longitudinal case studies on different types of network organisations to improve generalisation of the results. In this study, all three cases are about engineering network organisations, but with different types of services and product offerings. Therefore conducting more longitudinal case studies in similar areas or different industries will help to improve generalisation of the existing results.

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