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# Enabling Knowledge Sharing: new challenges for information systems

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# Enabling Knowledge Sharing: new challenges for information systems

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## Abstract

*Drawing from a longitudinal field study on an IS development in the Investment Banking industry, in this paper we explore the implications emerging from the IS role in the provision of knowledge-based services to clients. By analysing the unique process by which the 'IS under study' has been developed, we aim to identify and explain factors contributing to the IS's resounding success and especially its role as an enabler of knowledge sharing between the Company's financial analysts and clients. The paper aims to contribute to a deeper understanding of underlying processes of IS-organisation co-evolution that made the IS a success.*

## Keywords

knowledge sharing, IS development, knowledge-based services, IS-organisation co-evolution

## INTRODUCTION

Arguably the investment banking industry has long been an example of a knowledge intensive industry in the sense described by Drucker (1993), with highly trained experts providing advice to clients for the purposes of investment decision making. More recently, the processes by which these services are provided have become increasingly reliant on the use of sophisticated information systems (IS), with data regarding a particular company's financial status being processed, analysed and restructured to provide the basis for complex decision making models.

The objective of this paper is to identify and explain an emerging new role for IS in this context, the resulting changes to the nature of IS-organisation relationships and the implications of these changes for the provision of services to clients. This will be achieved by analysing the evolution of a core IS introduced in 1996 in the Equities Division of an International Investment Banking Company (IIBC) to assist in the provision of knowledge-based services to its clients. As the IS evolved it became a key medium for service provision and communication with clients, and consequently a significant source of competitive advantage for the Company under study. Observations of the continuous IS development enabled us to explore the transformation of the Company's service provision, associated changes to the work practices of financial analysts and the changing role of the IS in the complex relationship created between the users, developers of the system and Company clients.

The paper begins by describing the research methodology employed throughout the study and the general characteristics of the case study context. This will be followed by a description of the development of the IS, called CRIS, which forms the focus of the study. This description takes in 3 broad phases of development that were distinguished through the study, with each phase having its own impact on service provision and the changing nature of the IS-organisation relationship. This description forms the basis from which the emerging role of the IS in the functioning of the investment bank will be discussed. In particular we will

explain why and how CRIS has become, quite unexpectedly, a successful medium for knowledge sharing between the analysts and clients of the firm.

## **RESEARCH METHODOLOGY AND THE FIELD SITE**

The research method we adopted to study the evolution of the IS and its relationships with the Company is that of longitudinal field research (Pettigrew, 1990). As we were interested in organisational change and IS change and how one impacted on the other over time, we found *contextualism* (Pettigrew, 1985; Pepper, 1942) the most appropriate theory of method to inform our research. Namely, by focusing on the one hand, on the ongoing development of the IS to improve and enable service provisions to clients and on the other, on changes in work processes and the Company relationships with clients, our analysis has been conducted in a *contextualist mode*. This means firstly, that changes in one social entity are studied in the context of changes in other entities. In our study, the ongoing development of the IS and changes in its content, structure, and functionality are analysed within the context of changes in the Company, and more broadly in the investment banking industry. Moreover, IS' development is situated in the context of changes in Information Technology (IT) and information systems in other investment banking companies globally. Secondly, our analysis is temporal in nature, that is, it focuses on temporal interconnectedness of changes in both work processes and IS. Thirdly, in analysing changes in contexts we assume that "Context is not just a stimulus environment but a nested arrangement of structures and processes where the subjective interpretations of actors perceiving, comprehending, learning and remembering help shape process" (Pettigrew, 1990:270). We perceive processes of change in the IS as well as in the Company as both constrained by and at the same time shaping contexts. Finally, we view changes holistically with multiple, simultaneous interdependencies, which is the fourth essential characteristic of the adopted contextualist mode of research.

The study described in this paper focuses on the Equities Research Department in the Australian branch of IIBC which provides market and company analysis to internal clients (equity sales responsible for brokering shares to institutional investors) and external clients in the raising of capital (through the Investment Banking Division). As such the Equities Research Department does not directly generate revenue for the Company itself but supports the other departments, whose competitive advantage is dependent on the ability to provide high quality research to attract and retain clients. The Research Department consists of approximately 50 people, including directors, analysts, research assistants and clerical staff, grouped by industry sectors, e.g. resources, IT&T, banking & finance. Each sector group is responsible for the provision of research on listed companies that fall within their sector. There is also a small group of analysts responsible for the provision of macro economic information, e.g. interest rate forecasts, commodity prices and foreign exchange rates.

The Research Department also includes an IS team composed by 1 director; 2 technical support staff who have both IT and financial knowledge; 4 programmers and 1 computer trainer. The role of the IS team involves system development, technical support for the analysts when they experience difficulties, training of new analysts on how to use the system. A separate IT department in the Company is responsible for providing and maintaining the infrastructure, networks, computers etc. The IS team distinguish themselves from the IT department and perceive their roles and tasks clearly and squarely within the Research Department.

In 1995, to improve the Research Department's performance and make their 'knowledge products' more easily accessible for clients, the Company (Australian branch) decided to develop an information system. In 1996 they implemented the first version of the system, named Company Research IS (CRIS). In 1999 when we got involved in the research project (focusing on the Research Department's performance and the use and impact of CRIS), we found a well established IS team, working through somewhat contentious relationships with financial analysts in the Research Department. Since then we observed (as non-participant observers) the evolution of CRIS and the changes in service provision to clients, a changing client base, and the changing nature of the Company's competitive advantage. Moreover,

we observed changes in analysts' work practices and their attitudes towards CRIS, and subsequent impacts the system had on the quality of their work and ultimately on their ranking. We also observed how in turn these changes impacted on the relationships between the IS team and the analysts.

Our investigation in the local context includes regular visits to the Company, attendance of informal and some formal meetings, regular meetings and discussions with the IS Director and members of his team, and interviews with analysts and the General Manager. In 2000 we administered a survey in the Research Department to collect views and suggestions by analysts whose heavy working schedules prevented their continued participation throughout the whole period of our study. However, our visits enabled us to observe how analysts' and research assistants' work practices changed; we were also given access to the email correspondence between analysts and the IS team regarding complaints about CRIS' performance, the requirements for change and the changes undertaken. We also observed changes in the way clients interacted with the Company and its analysts, due to CRIS' implementation, and the impacts on the nature of client relationships with the Company. Our observations, however, had to be broadened as CRIS itself experienced continuous evolution interlinked with organisational changes.

While initially our study focused on the Research Department we soon realised that to make sense of the changes observed we needed to investigate the broader context of the investment banking industry and the global operations of IIBC in which our case study organisation resided. We also needed to collect information about other IS within the parent Company. This analysis was conducted based on documents and emails provided by the Company and sources available via the Internet and in the literature. We used the same sources to learn about proprietary IS in competing companies.

## **FIELD STUDY**

While the development of CRIS was ongoing since its introduction in 1996, there were several milestones that indicated its major changes in terms of content, functionality and interactivity. By following CRIS' development chronologically through its phases (see Figure 1), we focus here on its role in the Company's service provision and the changing relationship between the Company and its IS.

### **Phase 1: Collection and processing of analysts' financial models**

Following an initial proposal and approval by the Company's management, the IS team within the Research department developed the first version of CRIS in 1996 with the aim to improve services to its clients. During Phase 1, CRIS consisted of a database that recorded data sets and projections selected from financial models, individually created and maintained by analysts as spreadsheets on their own PCs (see Figure 2). (Analysts typically collect a vast amount of data about a particular company that enables them to gain a comprehensive understanding of its financial status and undertake various sophisticated analyses). Financial data sets uploaded into the database covered the local market, essentially Sydney and Melbourne, reflecting responsibilities of analysts and interests of clients. Before an analyst's data were uploaded into the CRIS' database a data entry control program to ensure high quality checked their consistency and accuracy. Having checked and consolidated data from analysts' models in a single database, the computer-based production of financial reports for clients (printed in a newsletter style) became feasible. During CRIS' early development, the purpose of the system was primarily to improve services to Company clients. Extensive market research was undertaken by the IS team to ascertain the breadth and depth of information clients required. Consequently, its output and impact was clearly assessable in terms of timeliness and accuracy of reports, client satisfaction, numbers of new clients, and contribution to Company profit.

While CRIS clearly achieved its goals, its operation was not without problems internally. Namely, from the very beginning, analysts displayed considerable resistance to the system. They objected to CRIS' development in the first place. They saw no need to introduce a database with their data sets in it 'just to produce the same reports as they did before' without the system. During Phase 1, the production of reports essentially added no value to

their work but required their time and input to maintain. Furthermore, they objected (though not explicitly) to being placed in a role of 'a data feeder to CRIS'. There were instances of analysts refusing to upload their data into CRIS and submitting logically incorrect data. A few also had serious difficulties in learning how to use CRIS. The majority, however, took it as an obligation and submitted their data sets (with more or less difficulty) without really bothering much about data accuracy and consistency or their appropriateness for the purpose. They did not perceive CRIS as 'their system' but rather as an alien and time-consuming intruder into their already frantic schedules.

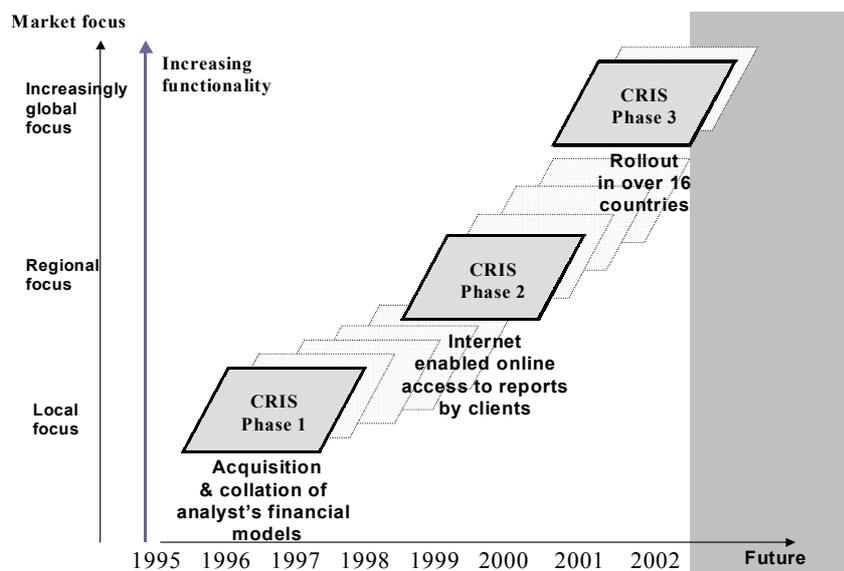


Figure 1: Three phases in CRIS evolution

The IS team on the other hand, at the very beginning did not pay much attention to or assumed they knew the analysts needs. Assuming that Company clients were the primary users the IS team focused on their needs and designed the database primarily to meet those. Analysts were treated as data suppliers and important only in relation to data quality. However, as opposition to the use of CRIS grew, they realised that they had to focus on analysts' needs as well. To gain analysts' 'buy-in' to the system, the IS team organised training seminars and technical support. In most cases seminars failed as analysts did not attend. Working individually with analysts gave better results. In addition, newly appointed research assistants and analysts were properly and systematically trained as part of their introduction to the job which produced excellent results.

Throughout Phase 1, the analysts' opposition to CRIS slowly decreased. At the same time CRIS' functionality improved. An in-house built workflow was linked to the database enabling coordination of many different participants (analysts, controllers, economists, editors) and the semi-automated production of reports for clients.

At the end of Phase 1 CRIS was a highly complex system, capable of producing over 150 different reports for clients, on a daily, weekly and monthly basis, as well as *ad hoc* reports. CRIS also provided the Research Department with an information resource through which analysts could access various external financial data online. CRIS was considered to be the state of the art amongst similar proprietary systems developed by competitors.

### Phase 2: Online access by clients via the Internet

Availability of online client access to CRIS' information resources demarcates the beginning of Phase 2. Instead of getting printed reports, clients could explore and download them via the Internet (see Figure 2). Key clients could also make special requests for information, not normally included in the analyst's reports, via CRIS' support team. These requests required analysts to feed further data into the system and were often associated with strong

resistance from analysts who were forced to spend considerable time updating their spreadsheets such that the additional information could be fed into the system.

CRIS' development in this Phase was often triggered by analysts' complaints and requests. Namely, as analysts and especially newly recruited research assistants gradually learned to use CRIS, they expressed their needs more clearly which stimulated further improvements and changes to the system. However, increasing functionality and complexity of CRIS (with new functions added on a weekly basis) was a real issue even for the most technically competent analysts. Consequently, it became increasingly more important for the IS team to understand analysts' tasks and for analysts to understand CRIS and how it could be developed further to be more valuable for them. Gradually through experience and one-to-one conversations with analysts, the IS team Director developed a process, he termed *hooking* for gaining the analyst's buy-in:

*I use a different approach for different people. With some I make friendship, we go to the pub, drink beer, we became mates and then they say 'Adam is a good guy, let's do it for him'. I charm them, I sell my personality. To some I do a special favour, help them in a critical moment, do special stuff for them and they appreciate this. You do things for people and they come to you, trust you... and would do things for you too... You have to win the people, once this has happened, it's only the good service you have to provide... Some however need a stick... in which case I rely on the General Manager.*

This process of one-to-one 'selling' provided an opportunity for the analysts and the Director to share their knowledge regarding the opportunities and requirements for CRIS on a regular basis, however, the Director openly acknowledged that the process of gaining buy-in or *hooking* one-to-one was not sustainable in the long run.

As it emerged throughout Phase 2, CRIS continued to develop in sophistication and complexity. It also shifted focus from the local market to the region, i.e. Australia and New Zealand. Some online market information (purchased from external information providers) were also included making CRIS more useful to the analysts. According to analysts with experience of competitor's proprietary information systems, CRIS was a more comprehensive and complex system. As one of the analysts commented,

*The systems of other firms are like a regular family car, they're easy to drive but limited in terms of their capabilities. Our system is more like a Ferrari, a bit harder to drive, but in the hands of a skilled individual capable of much higher performance.*

Despite complaints, interviews with analysts confirmed CRIS positively influenced the Research Department's performance. Furthermore, CRIS was now considered an important dimension of the company's product portfolio, even drawing its own income stream from clients' subscriptions.

### **Phase 3: Globalisation and expansion of online services**

Phase 3 was marked by CRIS' rollout to Company branches in other countries and by further expansion of its online services. Until 2001 CRIS' development and use had been limited to Australia and New Zealand. Globally, different branches of the Company had been given autonomy with regard to the IS they used or developed, resulting in a number of competing systems. In late 2000, Head Office (of IIBC) determined that all branches of the Company should implement a single IS (one to be developed in Head Office<sup>1</sup>). It was a serious threat to CRIS. As the Company was downsizing globally, cuts in Australia could have included the IS team (as a way to disable CRIS). In the period before the launch of the Head Office IS, however, a number of countries chose to adopt CRIS instead, practically

<sup>1</sup> How the decision was made, and why CRIS was not even considered, are beyond the scope of this paper.

creating a race between the two systems<sup>2</sup>. While the future of the race is uncertain, Adam, the IS team Director, seems confident that CRIS will survive:

*[The Head office IS] still may become compulsory [Company]-wide, but I believe we'll survive. We're doing really good stuff for real people and they pay us real cash. They won't get rid of us as long as we earn money. They know that it will be a huge loss for the Australian Branch here, a much bigger loss than the expected savings.*

Up to now CRIS has being rolled out in 16 other countries. There are about 5,000 individual users at the moment 'with 5-6 big ones that pay a lot of money' for their intensive use of CRIS. In a recent interview Adam explained that he had released a CD that users can install on their computers and use to connect to the CRIS database; using the software installed via CD clients can connect to CRIS and use it the same way Company analysts do.

## **ANALYSIS: TRANSFORMATION OF SERVICES PROVISION AND THE EMERGING ROLE OF IS**

The continual development and implementation of CRIS transformed the way services were provided to clients thereby impacting upon the relationship between the Company and its clients. Before the introduction of CRIS, the Company produced a range of reports (on a daily, weekly and monthly basis etc.) and distributed them to their clients. Based on their data and spreadsheet models, analysts produced required reports about specified companies (Figure 2a). These reports were collected, checked and edited by a dedicated group and then manually packaged into different reports mailed to clients. Analysts maintained direct communication with the key Company clients that enabled them to learn about clients' needs and also to provide them additional (informal) information about their reports.

During Phase 1, the manual production of clients' reports was replaced with CRIS (Figure 2b). Instead of producing individual reports, analysts uploaded selected sets of data from their spreadsheets to CRIS' database. Once recorded in the database, data from all analysts were available for cross-checking and processing. As a result clients' reports were more accurate, consistent and timely. In addition, very soon after the database was operational, it was realised that it was possible to produce a much wider range of reports than it was in the manual system.

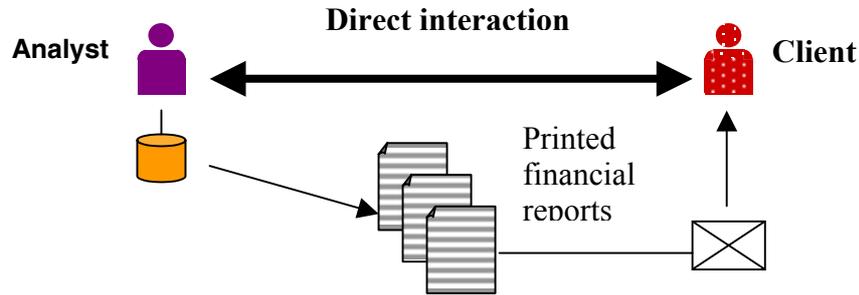
The introduction of CRIS may be seen as the first attempt to consolidate 'knowledge production' by the Company. Instead of having individual analysts producing their reports irrespective of each other and essentially disregarding Company relationships with clients, by implementing CRIS, the Company introduced a mediator between the analysts and the clients. While the process of mediation in Phase 1 was quite simple – collection, collation, checking of data and the processing of reports – it meant a significant change to the provision of services. For the first time, the data were treated as a Company resource and quality criteria were applied. The data analysts submitted had to be internally consistent (in several cases a simple logical checking of analysts' models showed inherent inconsistencies, like financial spreadsheets that didn't balance), timely and had to comply with the prescribed format. While the implementation of these quality criteria was painful, it did pay off. The quality of reports, analysts themselves admitted, significantly improved. So too did their own reputation among the clients.

Phase 2 introduced a further change to the service provision. Now clients got their reports via the Internet instantly, as they were produced without delays (due to printing and delivery) and in a much more flexible format. Enforcement of quality standards was more rigorous and non-compliance was not acceptable. It is interesting to note that it was not achieved by a coercive use of power but rather through intensified cooperation and improved mutual understanding between the IS team (especially the Director) and the analysts. The General

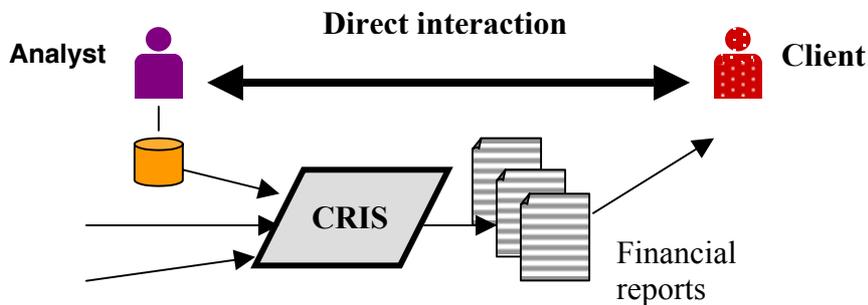
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<sup>2</sup> It was widely accepted throughout the Company that CRIS was superior system to the official one that was under development.

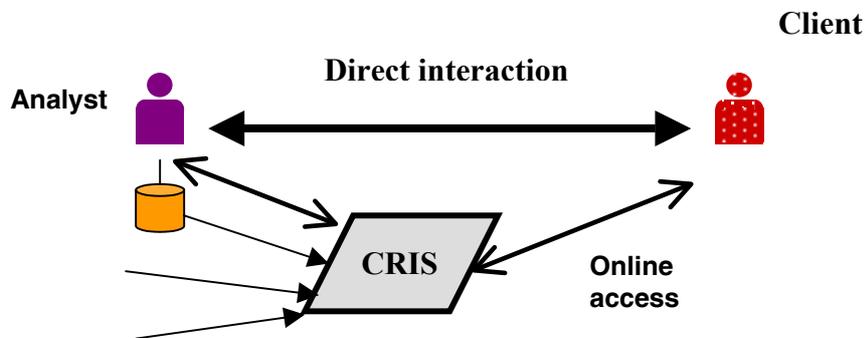
manager and the IS Director worked closely to introduce incentives and stimulating measures to encourage analysts to use CRIS and take a more active role in its continued development.



a) Service provision through analyst-client relationship and printed financial reports



b) Service provision through analyst-client relationship and through financial reports produced by CRIS (Phases 1 and 2)



c) Service provision through client's online access to CRIS and reduced direct interaction between analyst and client (Phase 3)

Figure 2: The changing role of CRIS in service provision to clients

In Phase 2 we observed a further shift in CRIS' integration with Company processes. On the one hand, CRIS became an indispensable vehicle for provision of reports and a rich source of information for its clients. Not only did it provide information about local companies, it also included companies from the region and information from external sources (Reuters, Bloomberg and others). On the other hand, by the end of Phase 2, CRIS became an integral part of the analysts' work processes. The adoption of CRIS was such that analysts could not conduct their own analysis without it. Economists' predictions and all external information analysts needed were only available through CRIS; all historical data, previously hardly available, were also there. CRIS made the analysts analysis more comprehensive and accurate. Despite its evident complexity, CRIS also made their work processes more

effective. Due to CRIS, the Company was well ahead of its competitors enjoying a competitive advantage in relation to this dimension of its service provision.

In Phase 3 with its rollout in other branches of the IIBC, CRIS' content has been expanded further so that it is now considered a global system. Improvements in functionality allow external clients to access the database directly apart from getting the reports (Figure 2c). This has further transformed the provision of services to clients.

During Phase 3 of CRIS' evolution, the process of consolidating the Company's service provision to clients as 'knowledge-based services' was completed. Through CRIS, analysts' expert knowledge is transformed into and presented as codified information (data and models in the database) that together with economists' models and data from external sources, can be accessed directly by clients, processed and presented in different formats to meet their needs. Provision of services to clients involves complex, mutually dependent sets of activities: from individual analysts and their learning, and information processing activities, to acquisition and presentation of information in the database, processing of this information based on a variety of models and functions as part of CRIS, and finally to clients who access the database and processed information to create their own knowledge about phenomena of interest. In this way CRIS has become a complex and sophisticated medium for the provision of knowledge-based services to clients.

Another aspect of the changing Company-client relationship was the weakening of analysts' interaction with clients. Namely, as clients learned to use CRIS and had more opportunity to process information according to their needs, they relied more on the Company's rich information sources in CRIS and depended less on direct interaction with analysts. While there were positive results in terms of improved client satisfaction, it reduced the chances for analysts to learn about the changing needs of clients. If a client had a new requirement, he/she would send a request to the IS team rather than the analysts.

In this brief analysis we have explained the continual development and evolution of CRIS through three phases and the way it transformed both the Company's service provision to clients and analysts' work practices. We also demonstrated how the nature and role of CRIS changed through this process. With increased emphasis on information in CRIS as a Company resource and on quality of knowledge-based services provided via CRIS, the role and perception of CRIS gradually changed, much beyond that originally envisaged. From a report generator CRIS transformed to become an essential medium for service provision and an indispensable enabler of Company-client relationships.

We have to emphasise though that the changes as experienced by the analysts, the Company management and clients (caused also by factors other than CRIS, such as changes in the industry globally), in turn impacted upon the development and sophistication of CRIS. CRIS was often changed in response to problems identified by analysts, clients or the IS team. The best way to fully appreciate the nature of changes in the Company and changes of CRIS is to look at them as mutually dependent and part of complex co-evolutionary processes (Ginsberg and Baum, 1993; Baum, 1999; Cecez-Kecmanovic and Kay, 2001). Both the Company and its IS in fact co-evolved through circular causal chains that are neither linear nor singular. The key issue in their co-evolution is the capability of all involved actors – analysts, clients and IS team members – to participate in and contribute to the complex knowledge sharing process among them. Namely, with the sophistication of CRIS, the provision of services to the Company clients has transformed to become a process of knowledge sharing between the analysts and the Company's clients. It's not only the quality of the analysts and their expert knowledge that now determine the quality of services. With CRIS capturing so-called codified expert knowledge, that we would rather call information, and clients' direct access to this information, the quality of services depends also on the ability of clients to re-create knowledge based on the information provided. As our analysis demonstrated, CRIS has become a medium through which this type of knowledge sharing has become possible. This role, however, was not envisaged by the IS team and no particular IS knowledge was available to help them develop such a system. This kind of IS role, we were surprised to realise, has not been discussed in relation to

similar IS. Serving as a medium and enabler of knowledge sharing is indeed a new role for an IS with which there is not much experience in practice.

## IS AS ENABLER OF KNOWLEDGE SHARING

As we have seen, the role and nature of CRIS changed from supporting the service provision to clients to being a key vehicle (medium) for the Company's 'production' of its knowledge-based products and services. In other words, CRIS has become a medium through which codified analysts' knowledge, that is information, is made available to clients. In fact, it is made available to clients in the same way as it is available to analysts, that is those who created it (including all the options: data, functions, processing models, presentation modes). When the client's background knowledge sufficiently overlaps with those of the analysts, the information base in CRIS may help the client re-create (at least partially) the analyst's original knowledge. In such a situation we claim that knowledge sharing occurred, enabled and assisted by CRIS. Consequently CRIS has to be seen as a medium of knowledge sharing between analysts (experts) and Company clients. While CRIS' co-evolution with the Company and especially its relationships with clients, as the above analysis shows, can explain how the system turned out to assume such a role (for more detailed explanation see Cecez-Kecmanovic and Kay, 2001), this does not and cannot explain its great success. The question is what factors and conditions gave rise to CRIS becoming a success? Furthermore, what in particular has made CRIS successful in its role of an enabler of knowledge sharing?

To answer these questions we need to consider the multiple relationships between three groups of people: analysts, clients and IS team members, and the computer-based system CRIS, involved in service provision and consumption (Figure 3). First, analysts and clients developed good working relationships (denoted by link **a** in Figure 3), evident from a very high ranking of Company analysts by the clients, which was a solid basis for gradual introduction of CRIS services. Due to their shared background knowledge and similarity of understanding of Company research, clients were able to understand first reports from CRIS and then, as of Phase 2, information and functions in CRIS (link **f** in Figure 3). Furthermore, the relationship between clients and the IS team (link **c** in Figure 3) evolved out of investigation of clients' needs and subsequent additions/ changes in CRIS database to meet these needs. In particular, the IS Director was very successful in exploring and anticipating clients' needs thus strengthening their relationship.

Second, in order to design, maintain and change CRIS, the IS team also needed to have a good understanding of analysts views, expertise and needs. While at the beginning the analysts had negative attitude toward CRIS development, they gradually realised its usefulness and learned to use it. With the IS team's improved understanding of analysts' work, their research and their needs, the analyst-IS team relationship (link **b**) also improved. The IS Director, as we have seen, played a key role here as well. The more the IS team understood analysts needs and the more they were successful in changing/ advancing CRIS to meet their needs, the better their relationship with analysts became. Consequently, CRIS provided more valuable services to the analysts (link **e**).

Third, as the IS team kept developing relationships **b** and **c**; their understanding of the Company's research and analysts' expert knowledge grew. Consequently, they became more successful in CRIS' continual development (link **d**) and with its increased use they got more feedback from the users – both analysts and clients. The ensuing evolution and sophistication of **e** and **f** links lead to an increasing number of users and their growing dependence on CRIS' support in everyday practice. Thus gradually the nature of **e** and **f** links transformed, enabling knowledge sharing between analysts and clients via CRIS.

This brief discussion indicates that the development of productive and creative relationships **a**, **b** and **c** was essential for CRIS' success and its role as an enabler of knowledge sharing. To help explain the meaning of these relationships and factors influencing them concepts from Maturana and Varela's (1980; 1992) autopoietic theory has some value. To develop relationships **a**, **b** and **c** these three groups of people needed to develop a *consensual*

*domain* defined by sets of mutually triggering interlocking behaviours (Kay and Cecez-Kecmanovic, 2002). The consensual domain, as we have observed, developed through shared experiences and a history of interactions among the analysts, IS team members and clients. The development or emergence of a consensual domains means increased mutual understanding and more congruent mental models among analysts and clients (link **a**) on the one hand, and analysts – IS team members (link **b**), and clients – IS team members (link **c**), on the other. An indication of the emergence of a consensual domain is the coordinated action by the actors involved. The high rate of adoption of CRIS as of Phase 2 by analysts, for instance, indicates that the IS team and analysts achieved sufficient shared understanding and developed a consensual domain that enabled the IS team to continually develop CRIS. Similarly, the increasing use of CRIS by clients is an indication of the consensual domain emerging between the clients and analysts, as well as between the clients and the IS team. Therefore, for an IS to be a successful enabler of knowledge sharing between analysts and clients, a minimum level of mutual understanding and a consensual domain had to be developed among them and between them, and the IS team.

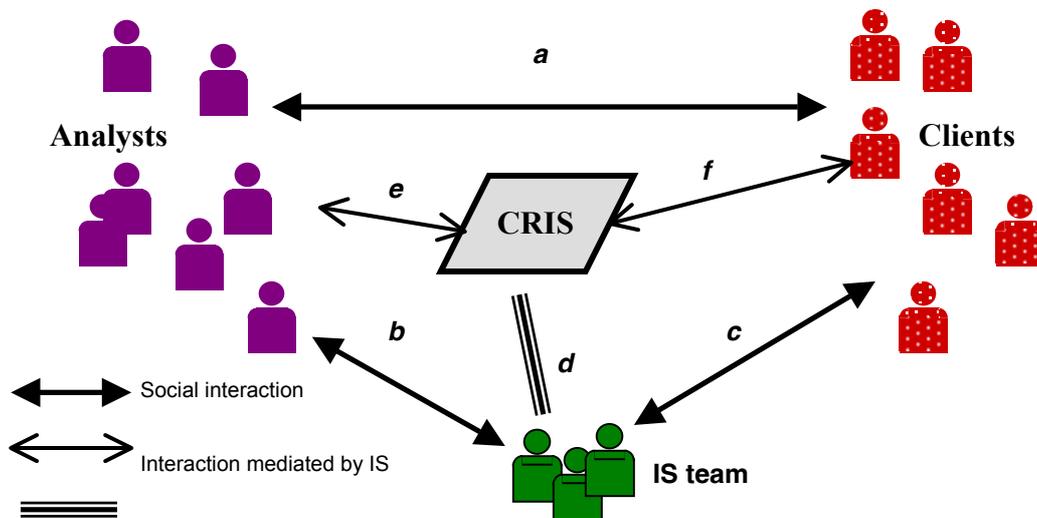


Figure 3: The relationship between three groups of people – analysts, IS team and clients – essential for CRIS' success

The next question is how can a consensual domain be developed and mutual understanding achieved? According to Maturana and Varela's theory (1992), a consensual domain occurs as a result of interactions between individuals that overtime have become recurrent, i.e. they (as *autopoietic unities*) develop a common history of experience. Maturana and Varela describe this process as *structural coupling*. In the context of our field study Company, the degree of structural coupling enables the analysts and clients to attribute the same or sufficiently similar meanings to information and therefore co-create knowledge (otherwise considered sharing knowledge). Consequently analysts' knowledge, codified and presented as information in CRIS, becomes meaningful to clients. By interpreting information from CRIS within their world views (individual structures), clients re-create the knowledge of the analysts and thus expand their capacity to make decisions. The process of structural coupling depends also on the motivation of participating individuals and any expected rewards. In our case both analysts and clients are highly motivated to become structurally coupled and develop a consensual domain. Analysts' individual success, financial rewards and promotion depend directly on the satisfaction of clients. On the other hand, clients choose a company that can best meet their needs and whose information are of highest value to them (increase their capacity to act and reap rewards). They too are motivated to develop a consensual domain with analysts to be able to share in their knowledge (partly directly and partly via CRIS).

A parallel process of structural coupling emerged between the IS team and analysts and between the IS team and clients as well. As we have seen, initially analysts did not have motivation to engage in any interaction with the IS team. For them it was pretty difficult to

anticipate the future of the IS and its practical value. Clients, on the other hand, showed some interest but not exactly a great enthusiasm. However, due to his leadership qualities, the IS Director managed to establish personal relationships with users (both analysts and clients) which enabled him to learn about their needs and to motivate them to try new functions and information processed by CRIS. In his role as an "IT champion" (Beath, 1991) the IS Director was capable of projecting his vision of CRIS both inside and outside the Company, despite initial obstacles. The 'IT champion' role of the Director was a key factor that fostered structural coupling between the IS team, on the one hand, and analysts and clients, on the other. The resulting consensual domain between these three groups of people enabled CRIS' continuing development that successfully responded to changing needs of analysts and clients (and changes in their environments). At the same time, CRIS' development and increased use contributed to their further structural coupling, thus enhancing a consensual domain.

The process of structural coupling holds many parallels with Weick and Roberts's (1993) notion of *heedful interrelating* among members of a group and the emergence of a *collective mind*. By interacting heedfully, and taking other' views into account and responding to these with heed, actors develop shared understanding and collective mind. In other words they develop a consensual domain. This is particularly visible in the way the IS team members relate to analysts and clients. When they actually changed their attitude towards analysts and started to interact with them heedfully, the IS team members succeeded in changing CRIS to meet their needs. The same process may be seen to be occurring with the Company's clients, as some external clients use CRIS intensively (the same way analysts use it), the Director emphasises how he works closely with these clients to understand their needs and then develop features of CRIS to meet these needs. Once they use a new feature and gain experience of it, they respond either by accepting it or suggesting changes. As an example of heedful interrelating, the Director-clients interaction, through the process of hooking described above, shows how a consensual domain has been developed, leading to ongoing changes in CRIS.

While these two theoretical explanations are based on significantly different theories, they provide compatible explanations for why and how CRIS became so successful as an enabler of knowledge sharing. Furthermore, these theoretical explanations help us understand why the Company-CRIS co-evolution was not and could not be imitable and how it assured the Company's sustained competitive advantage (Kay and Cecez-Kecmanovic, 2001).

## CONCLUSION

In this paper we have explored the changing nature of IS-organisation relationships within the investment banking industry, via a longitudinal case study. It was found that through the development of a core IS, the processes by which the Company facilitated its service provision to clients changed from a relatively simple face to face interaction, to a more complex IS-mediated knowledge sharing process, involving emerging sets of relationships between analysts, IS developers and the Company's clients. It was demonstrated that over time, the ongoing interactions between these groups of people produced what may be termed consensual domains (Maturana and Varela, 1980), or domains of recurrent interaction between the analysts and the IS team, the analysts and clients, and the IS team and clients. The production of consensual domains, in the sense described in this paper, provided the basis for the development of mutual understanding between the three groups, allowing not only for improved service provision, but also the development of ongoing improvements to CRIS. This process of continuous improvement drew on the perspectives of all involved and supported the development of a highly sophisticated IS. The pattern of interactions that was observed through the case study, also resulted in significant changes to the work practices, not only of the analysts but also the clients of the investment bank. Work practices became structurally coupled to the IS, in the sense that key information was both accessed through and produced in the IS, making it impossible for analysts to undertake their work without CRIS. Similarly, as clients have gained more access to the system, their work practices have become increasingly linked to the processes in CRIS,

thereby increasing levels of co-dependence and the strength of the relationship between the service provider and the client.

The most interesting and unexpected outcome from CRIS' development was its emerging role as a medium for knowledge sharing between the analysts and the Company's clients. By investigating emergent processes of structural coupling between the three groups involved with CRIS, we explained how and why CRIS has become successful as a medium for knowledge sharing. While our analysis remains limited to the case Company and its core IS, the lessons learned in this regard and the theoretical explanations of processes underlying IS-organisation co-evolution make a contribution to the understanding of the IS role as a mediator of knowledge sharing. In addition, the paper has a practical significance for other knowledge-intensive firms, especially as they embrace e-commerce and make an attempt to establish patterns of behaviour like those described in this paper.

The longitudinal field study continues, focusing on issues of globalisation including developments in the Head office IS, changes to CRIS as a result and the IS' ongoing role in enabling knowledge sharing between the groups of people involved. Arguably as more knowledge-based organisations develop sophisticated IS for their service provision, the issues discussed here will become more common and better frameworks for understanding and facilitating the required ongoing developments will be needed. These issues are important, not only to large firms, such as our case study organisation, but increasingly to society in general as the shift to online processes of doing business continue and IS become the key enabler of these interactions.

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