COLLABORATION IN HIGH TECHNOLOGY COMPANIES IN IRELAND: THREE CASE STUDIES

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Introduction

High technology companies now play a significant role in Ireland's economy. For the year 2001 (during which time the case research reported in this paper was undertaken), computer equipment alone accounted for almost 25% of Ireland's exports (Central Statistics Office, 2002). The output of high technology companies is frequently the result of the efforts of many different companies, culminating in the activities of a system integrator. The relationships between system integrators and their suppliers can range across a spectrum of possibilities from that of traditional "arms length" to one of tight coupling. This paper focuses on the latter end of this spectrum, with a cross case analysis of three Irish-based high technology system integrators and the evolving nature of their collaborative relationships with their suppliers. The case data presented was gathered in the latter half of 2001 as part of CO-IMPROVE – an EU-funded research project focused on collaborative improvement within extended manaufacturing enterprises (EMEs).

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Collaborative Improvement in the Extended Manufacturing Enterprise: The CO-IMPROVE Project

Collaboration

The concept of the extended manufacturing enterprise differs from that of the "supply network" (Childe, 1998), viewing suppliers as part of the principal company with all parties involved focused on maximising the benefits of the business they are involved in. Knowledge is seen as a key driver of value creation and understanding in these networks, as knowledge encoding mechanisms help to explain the sources of value for these organisational forms (Kogut, Shan & Walker, 1992). A well-developed collaborative learning capability is seen as critical to the alignment and improvement of value-adding activities of collaborating partners in the EME.

Collaboration is premised upon the creation of long-term relationships, the development of complementary capabilities and engagement in joint planning (Macbeth, 1994). Major benefits associated with inter-firm collaboration derive from the opportunity to access new markets, new technologies and new skills, to reduce operational costs and product time to market, and to optimise overall supply chain performance (Kogut, 1989; Hagedoorn, 1993; Eisenhardt and Schoonhoven, 1996). Collaborative improvement (CoI) – a particular form of inter-firm collaboration – may be defined as:

> "…a purposeful inter-company interactive process that focuses on continuous incremental innovation, aimed at enhancing the EME overall operational performance. It is simultaneously concerned with bringing about change in the EME, developing the EME's capabilities, and generating actionable knowledge. Finally, it is an evolving systematic change process that is undertaken in a spirit of collaboration and learning" (Cagliano, Caniato, Corso & Spina, 2002: 134).

The CO-IMPROVE Project

CO-IMPROVE (G1RD-CT2000-00299) is an EU-funded project of three years' duration, which commenced in March 2001. The objectives of CO-IMPROVE are to develop a business model, supported by a web-based technical system, and action learning-based implementation guidelines to support the design, implementation and ongoing development of collaborative improvement between partners in

EMEs. The CO-IMPROVE project stems from a recognition that competitiveness of European companies will rely increasingly on how fit they are as innovative and knowledge creative players within dynamic, complex integrated networks. Academic partners include Aalborg University, Politecnico di Milano, Trinity College Dublin and University of Twente. Industrial partners, including EMEs, are drawn from Denmark, Italy, the Netherlands and Sweden.

Research Design

CO-IMPROVE commenced in March 2001. Over its first six months, data gathering included a series of semi-structured interviews with the senior purchasing and engineering managers in the system integrator at the centre of EMEs in Denmark, Ireland, Italy and the Netherlands. The three system integrators located in Ireland each managed a network of suppliers located within and outside Ireland. The interviews addressed both the concept of collaboration and the scope for collaborative improvement activities in the EME. The interviews gathered data in the following areas:

- The operating environment and primary processes
- The nature of collaboration and collaborative improvement across the supply chain including current challenges to collaborative strategies
- Communication and relationship management with suppliers

Crucially, from an analytical perspective, the interviews took place against the backdrop of an economic downturn which had the potential to impact the scope for collaborative improvement activities in the EMEs. As such, there was an opportunity to compare and contrast the change responses in each case.

Findings

This section introduces the three system integrators in Ireland, describes the characteristics of their relationships with their supplier networks, describes the discontinuities in their environment, and outlines the response strategies in each case.

The System Integrators

The three system integrators were located in Ireland and each managed a network of suppliers located within and outside Ireland. For the purposes of this paper, the system integrators will be identified as Companies A, B and C. Summary details of each are listed in **Table 1**.

TABLE 1: STRATEGIC ASPECTS OF CASE STUDIES

Focus	**Company A**	**Company B**	**Company C**
Strategy	Cost/Differentiation	Differentiation	Cost/Differentiation
Margin	High Margins	High Margins	Low to Medium Margins
Product Volume	High Volume	Low Volume	High Volume
Customisation	Some Customisation, mainly Batch Production of high value units	High Customisation, One Off	Limited Customisation Batch Production
Market	Quality-focussed	Quality-focussed	Price-constrained
Quality	System Performance	System Performance	Precision - High Yield

Company A was a large subsidiary of a multi-national firm engaged in the provision of information systems solutions for government and commercial customers in Europe, Africa, the Middle East, Far East and Pacific Rim. Its scope of activities included software design, testing, repair, maintenance, engineering and customer support. Demand for products was seasonal. Competitive position was based upon product design and extensive reliability testing.

Company B was a small company involved in the design, manufacture, installation and support of customised process equipment for customers worldwide in the semiconductor industry. Its scope of activities included hardware and software development and integration.

Company C was a specialist supplier of high-specification, high-volume, low-production cost products to the healthcare,

telecommunication and aerospace sector. Its scope of activities included manufacturing, assembling, testing and customer support. Demand was seasonal and, additionally, volatile, based upon environmental and market influences. Competitive position was based on limited customisation, engineered quality control and reliable precision products.

Supplier Relationships Characteristics

Each system integrator exhibited different approaches to managing the relationships with and among their network of suppliers. The characteristics of these relationships are summarised in **Table 2**.

Company A had developed and maintained a stable network of approximately 11 suppliers since establishing a plant in Ireland. They described supplier relationships as 'tough but fair'. Key success factors in managing supplier relationships were felt to include reliability, honesty, flexibility and openness to intervention from Company A. Their buyer power reflected their size, and many of their suppliers – even global players – had located assembly operations or a supply hub close to the Company. Some of these suppliers had been taken over but had continued to maintain links with Company A and had offered a wider range of services.

TABLE 2: SUPPLIER RELATIONSHIP CHARACTERISTICS

Characteristics		**Company A**	**Company B**	**Company C**
No. of Suppliers		Few	Few	Few
Length of relationship		Over many years	Relatively recent	Relatively recent
Relationship Characteristics	Items sourced	Components	Major subsystems	Components and subsystems
	Degree of coupling	Loose	Tight	Tight
	Information sharing	Medium	High	Increasing
	Knowledge transfer	Very limited: product and process	High: product	High: process
	Supplier performance	High quality and on-time	Supplier reliability issues	High yield and flexibility

Company A staff facilitated such stability by working with key supplier personnel. This personal contact was key, as records of transactions dated back only six months. Communication was characterised as "rich enough" to manage the challenges of an unpredictable competitive environment and was felt to generate intimate knowledge, goodwill and a sense of urgency and fairness. Information shared included schedules, quality assessments, review and feedback procedures and regular updates of corporate forecasts. Relationships were managed formally *via* quarterly supplier reviews (evaluating quality, service, pricing, communication and delivery) and on-site and corporate (twice-yearly) strategy meetings generating business updates and surfacing supply issues. Problems were dealt with by involving suppliers from the earliest stage to enable root cause analysis. In addition, they had involved suppliers to the suppliers although knowledge transfer was limited to product and process related issues.

Company B integrated manufactured components sourced from a small number of key suppliers. Many of the supplier relationships had been established only recently. In working closely with their suppliers, they placed key people "on-site". In this way, they attempted to control processes and to generate improvement ideas. Information exchanged included production schedules, access to manufacturing cycles and Gantt charts although not cost details. Knowledge transfer related to product technology and improvement possibilities. Company B saw frequent meetings as key to collaboration and to a clear understanding of the expectations of both parties. Visibility and clarity, rather than surprises, were felt to be essential and they required suppliers to keep them informed of progress, enabling them to deal with problems as they arose. They organised weekly meetings on a formal basis, supplemented by bi-weekly updates, service schedules and milestones. Interaction at these meetings was largely informal.

Company B saw relationship management as premised upon a reasonable balance of power on either side of the relationship. They saw collaboration in terms of negotiation and improvement. As a small company, they sourced vendors who perceived a strategic benefit from working with them. Schedules and action lists, while important, did not remove the need to negotiate on cost, discounts and deadlines or to deal with difficulties from sub-suppliers. In this context, Company B felt that understanding the people and the rationale behind decisions taken by suppliers and customers, and

dealing with "like-minded" people who relished changes and challenges were key to relationship management. As such, much of the success of collaborative projects rested not alone on the content of improvements but also on the negotiation process and on the management of people, power and politics.

Company C worked closely with suppliers, although these were recently established relationships. Collaboration was premised upon managing relations around mutually beneficial partnerships with interaction and communication seen as evolving towards understanding each partner's point of view. Co-operative practices, learning from problems and commitment to quality were key drivers of relationships. Information-sharing was increasing between the company and its suppliers, with knowledge transfer relating to process. While Company C dictated engineering details and output specifications, suppliers were becoming more knowledgeable about engineering and operational issues. In this respect, levels of trust and confidence had been established early. Relationships were managed *via* six-monthly meetings concerned with strategic planning and development, and included quality evaluation, costing, forecasting and scheduling. Key success factors within supplier relationships were felt to include quality, reliability, flexibility, transparency, and process intervention.

Discontinuity in the Environment

The recent slowdown in the global economy – a period of discontinuity – has been a source of change and has prompted many organisations to re-examine their collaborative strategies. The discontinuity triggered strategic choices by the three system integrators in the management of their collaborative relationships. The nature and impact of the discontinuity for each company are listed in **Table 3**.

Responding to a downturn in their product market, *Company A* did not cease collaboration with their suppliers but began to compromise and re-negotiate. The initial response involved relatively minor scheduling changes targeted at specific suppliers. Change was seen largely at planning levels with rescheduling of supplies a major feature. Responsibility for managing this change process was delegated to middle management level within the organisation. Ongoing communication, characterised by both formal and informal interaction, was a feature of this response with an emphasis on timely information exchange. In this regard, the focus was on maintaining

collaborative relationships and, where possible, on assisting suppliers to make the necessary adjustments. Working closely with key supplier staff across their supply network and leveraging the openness and trust that had been built up over the term of their supply relationship contributed to managing adjustments.

TABLE 3: DISCONTINUITY IN THE ENVIRONMENT

Discontinuity	Company A	Company B	Company C
Market	Downturn in product market	Downturn in processor market	Downturn in telecoms market
Actions taken	Informal and ongoing negotiations	Move towards vertical integration	Shift to lower cost manufacturing location base
Implications for collaboration	Greater	Much reduced	Accelerated

Company B responded to a downturn in their market with a move toward increased vertical integration. In this response, they anticipated future problems with a specific supplier and moved a number of processes in-house so reducing collaboration. With their remaining supplier relationships, a change in collaborative style was evident with the protection and maintenance of key suppliers a priority. Further, there was an increased emphasis on negotiation and a shift in management mindset to motivate suppliers to continue operations.

Company C's response to a downturn in their market can be characterised by increased outsourcing and shifting activities to a lower-cost manufacturing base. This response was influenced by an element of anticipation coupled with a precautionary reduction of reliance on a single industry. The change had implications for work, people and structure.

Discussion

In this section, the paper will compare and contrast the three case studies presented earlier. The cross case analysis will examine different choices faced by these systems integrators in their

management of collaborative relationships with their supply bases in response to environmental discontinuities.

Change, Collaboration and the CO-IMPROVE Project

Nadler (1998) presents a four-quadrant schema that plots anticipatory and reactive timing of change against incremental and discontinuous scope of change respectively and describes the following four responses to change:

- **Tuning:** the firm anticipates a change in conditions and takes incremental action
- **Adapting:** the firm reacts to a change in conditions and takes incremental action
- **Redirecting:** the firm anticipates a change in conditions and takes radical action
- **Overhauling:** the firm reacts to a change in conditions and takes radical action

TABLE 4: DISCONTINUITY AND MANAGEMENT OF SUPPLIER RELATIONSHIPS: CHANGE RESPONSE STRATEGIES (ADAPTATION OF NADLER, 1998)

Characteristic	Company A	Company B	Company C
Driving force	Response to current disequilibrium	Anticipation of future disequilibrium	Response to current disequilibrium
Focus of change	Individual supplier arrangements	Supplier strategy, work, people, structure	Whole organisation including core values
Role of senior management	General support; delegate to middle management	Key drivers; creation of urgency and persistence	Key drivers; making good strategic decisions
Change management requirements	Relatively minor; mostly implementation planning issues	Major; creating sense of urgency and motivation for change	Major; creating vision and optimism; dealing with resistance

Returning now to the case data, **Table 4** presents a characterisation of the different responses by the companies to the discontinuities in their environments. The form of this characterisation is adapted from Nadler (1998).

The two basic types of change, incremental and discontinuous – as described earlier – are evident in the cases. In addition, anticipatory and reactive timing of change are evident. Combining these dimensions of scope and timing of change, and applying Nadler's (1998) four-quadrant schema, the following differences in change response emerge:

- Responding to a downturn in their product market, *Company A's* change response can be characterised initially as *adapting*, although increasingly they were moving toward an *overhauling* approach.
- *Company B's* strategy is characterised as a *redirecting* approach.
- Responding to a downturn in the telecoms market, *Company C* can be characterised as an *overhauling* approach with many activities shifted to a lower-cost manufacturing base.

Conclusion

In the most recently published A.T. Kearney/*Foreign Policy* magazine Globalization Index (2002), Ireland ranked as the most global nation in the world. On this basis, high technology companies based in Ireland can be regarded as especially sensitive to changes in the global economy. This paper has analysed the responses of three such companies during the course of a major global discontinuity in the traditional trajectory of their respective industries in the area of collaboration with their suppliers. Within this context, an adaptation of Nadler's (1998) change response framework proved to be a robust tool for analysing and interpreting the behaviour of the companies. It would be of interest to undertake similar studies for companies in less global economies than that of Ireland. This would allow cross-country comparisons to be drawn and would further serve to validate the robustness of this paper's adaptation of Nadler's framework.

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