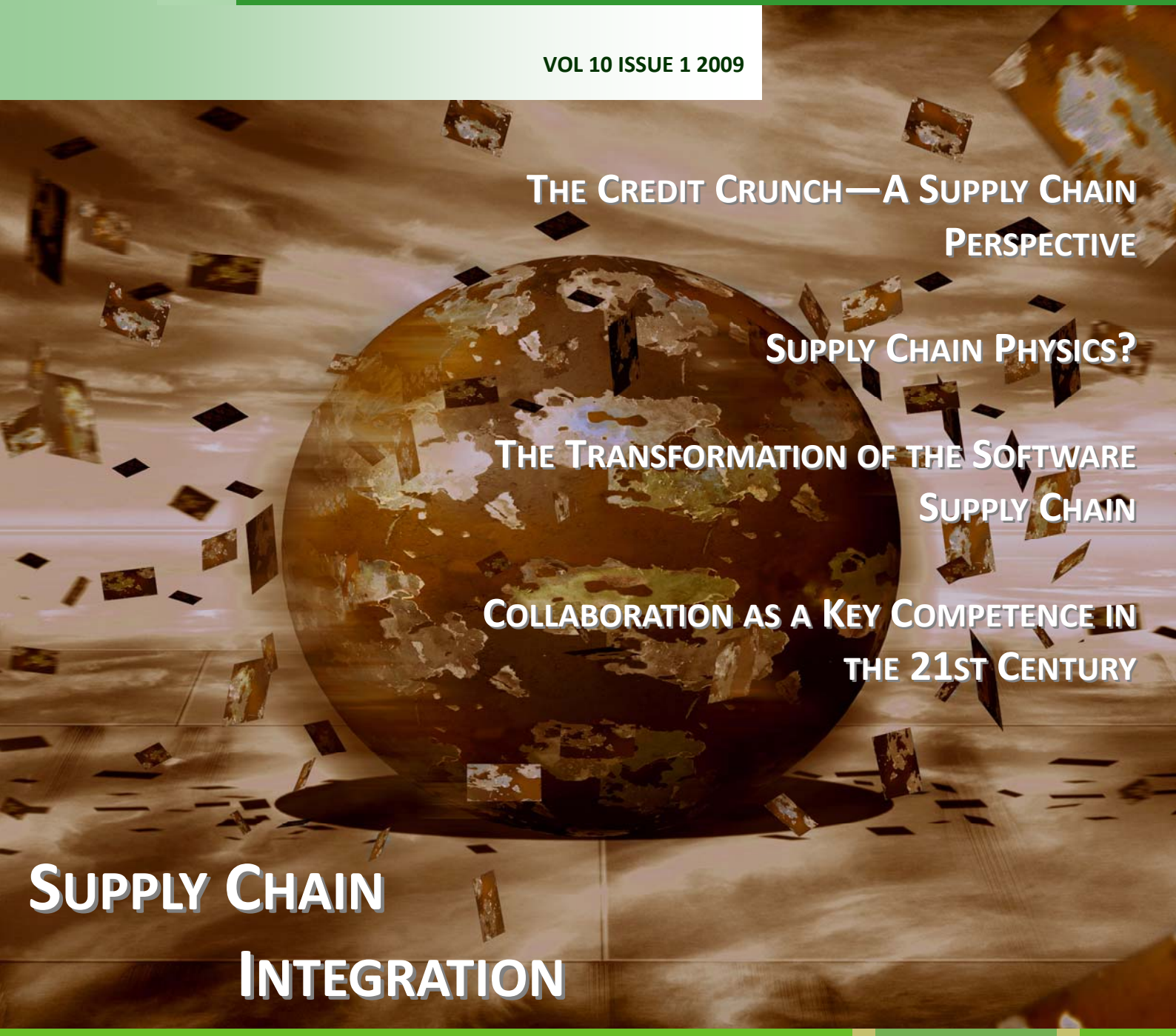
Supply Chain Perspectives

VOL 10 ISSUE 1 2009



The Credit Crunch—A Supply Chain Perspective

Supply Chain Physics?

The Transformation of the Software Supply Chain

Collaboration as a Key Competence in the 21st Century

Supply Chain Integration

nitl
National Institute for Transport and Logistics

Dublin Institute of Technology
Institiúid Teicneolaíochta Átha Cliath
D·I·T

Upcoming NITL Learning Modules

All modules are part of NITL's Executive Masters (which leads to the award of an M.Sc.) or SCM Development Programme (which leads to the award of a Post-Experience Certificate or Diploma). However, all modules are self-contained and may be taken as one-off short courses. They provide an ideal vehicle for updating knowledge, skills and competencies in the areas in question. Each module runs as follows: Thursday (1830 – 2100); Friday (0830-1730); and, Saturday (0830-1600).

For further information or to register for any module contact Antonio at adelinares@dit.ie or (01) 4024023.

Executive Masters Introduction to Supply Chain Management

Dublin
Introduction to Supply Chain Management - 14th-16th & 21st-23rd May
Introduction to Supply Chain Management - 8th-10th & 15th-17th October
Cork
Introduction to Supply Chain Management - 5th-7th & 12th-14th November

Other M.Sc. Modules

Dublin
Transport and Distribution Management - 21st-23rd & 28th-30th May
Partnership in SCM - 11th- 13th & 18th -20th June
Simulation of Supply Chains - 17th-19th & 24th -26th September
Understanding Customer Service - 8th-10th & 15th -17th October
Human Resource Management in the Supply Chain - 5th-7th & 12th-14th November
Project Planning Management and Control - 3rd-5th & 10th-12th December

Cork
Production Planning and Control -14th -16th & 21st – 23rd May
Change Management and Organisation Development - 11th- 13th & 18th – 20th June
Project Planning Management and Control - 17th -19th & 24th – 26th September
Inventory Management - 3rd-5th & 10th-12th December

Upcoming Dublin Modules for Certificate/Diploma in SCM

Transport Management - 7th- 9th May
Financial Management Fundamentals - 18th – 20th June
Partnerships in Supply Chain Management - 10th -12th September
Introduction to Supply Chain Management -15th-17th October
Information Technology in the Supply Chain - 29th- 31st October
Production Planning and Control - 26th- 28th November

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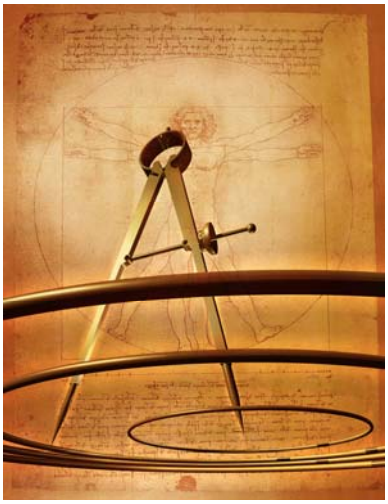

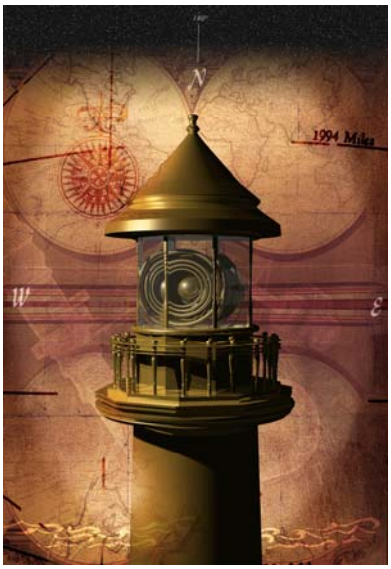

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Editorial

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Welcome to Issue 1 of NITL's new web-based magazine *Supply Chain Perspectives (SCP)*. *SCP* is a peer-reviewed publication, which aims to create awareness about leading edge supply chain management (SCM) and logistics themes among practitioners in this field. It will also keep readers informed of key developments in NITL and in the wider Irish SCM community.

Supply Chain Perspectives replaces *Logistics Solutions* which NITL published for almost a decade. Whilst the overall aim and audience of the new publication will remain similar the name change reflects a change in emphasis. Firstly, the new magazine will not be confined to purely transportation and logistics issues; rather, it will adopt a wider SCM outlook. NITL regards logistics as just one - albeit hugely important - element in the supply chain. Secondly, the word "Perspectives" has deliberately been included in the title to indicate that there are few "rights" and "wrongs" in relation to strategic SCM and logistics. Each article's contributor brings his/her own unique insights based on the nature of their experience. These insights of all of value and the challenge for the reader is to relate the different emphases and priorities inherent in these perspectives to their own challenges and strategic imperatives.

This issue has two interesting and topical "thinkpieces". Des Lee's article explains the credit crunch through the adoption of an SCM perspective. Patrick Daly's article explores SCM through the prism of natural physics. Interestingly in the current climate, his piece concludes that:

> *You cannot cut your way back to success; you are going to have to innovate and be creative to thrive and prosper in the face of challenge.*

The two research-based articles are both based on projects in which NITL has had an involvement. Colm Ryan and Claudia Wagner explore the issue of digital supply chains, with a specific emphasis on software distribution. This work has its genesis in a successful project carried out by Colm as part of his M.Sc. studies and it is an area in which NITL has an ongoing involvement. The second – by Bititci et al - reports on research which was funded through an EU Leonardo da Vinci project with the objective of facilitating collaboration among European SMEs.

In addition to these feature articles the Supply Chain Focus section covers events and issues in NITL and in the wider Irish SCM community. We have also included our popular website review section, written on this occasion by Erica Staller of Arizona State University.

Finally, we are interested in hearing from you. NITL invites SCM academics, consultants and practitioners to submit ideas for articles and/or news features to the magazine's editor Edward Sweeney (edward.sweeney@dit.ie). All ideas will be considered but those which relate to the role of logistics and SCM in the current volatile economic environment are particularly welcome.

Your NITL Team

SUPPLY CHAIN MANAGEMENT FORUM
A Review of Developments at NITL and the World of SCM

NITL Announces *Logistics Ireland 2009*

NITL, along with its partners at the Chartered Institute of Logistics and Transport (CILT), recently announced details of this year's *Logistics Ireland*. Following the success of last year's conference *Logistics Ireland 2009* will again be held at the Crowne Plaza Hotel, Dublin – Northwood, on Tuesday October 20th. The event is Ireland's premier supply chain management (SCM) and logistics conference.

The theme for this year is *Supply Chain Management and Logistics in a Volatile Global Economy*. The recent economic turbulence has sharpened the focus on the need for more robust approaches to SCM in improving competitive advantage and achieving value for money. Logistics Ireland 2009 will introduce participants to leading edge thinking in SCM and logistics with a view to optimising cost and customer service performance. It will be built around five keynote speakers and an interactive Q&A session. Among the speakers confirmed is Professor Martin Christopher of Cranfield School of Management, UK, recognised as one of the world's leading experts in this field.

LOGISTICS IRELAND
Ireland's Premier Supply Chain Management Conference

Diary Marker

***Date:* Tuesday October 20th 2009**
***Time:* 8.30am – 2pm**
***Venue:* Crowne Plaza Hotel, Dublin – Northwood**

NITL's Work Attracts Considerable Media Interest

Various aspects of NITL's work has attracted considerable media interest in recent months. For example, a report on "Ireland's Supply Chain" in the *Irish Times* in March was based largely on contributions from NITL experts. The various articles covered customer service and technology issues, as well as covering specific issues in relation to ports and airports.

Another recent series of articles in the *Sunday Business Post* noted that SCM used to be seen as something of an add-on, but not something that was critical to a business's ultimate success. But many things that seemed superfluous in the past have proven to be absolutely crucial to the present. Far from being an add-on service, expertise in SCM could be something that saves Ireland from the jaws of a particularly nasty recession.

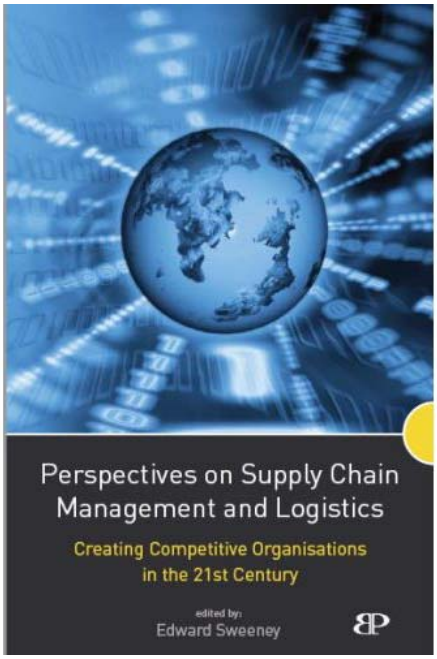
The interest of the media in SCM issues is indicative of its critical role in tacking the challenges presented by the current economic volatility. For further information about NITL and SCM in the media visit http://www.nitl.ie/NITL_in_the_Media/

New SCM Book to be Published

Edward Sweeney of NITL has signed an agreement with Blackhall Publishing in Dublin for publication of a new book – *Supply Chain Management and Logistics in a Volatile Global Environment*. This follows on from the publication by Blackhall in 2007 of *Perspectives on Supply Chain Management and Logistics: Creating Competitive Organisations in the 21st Century.*

The title of the new volume reflects the volatility in the current economic and business environment and the potential role of SCM and logistics in addressing some of these challenges. NITL is delighted to have assembled a group of leading international academics who will contribute chapters to the new book. These include Prof. Martin Christopher, Prof. Richard Wilding, Prof. Alan McKinnon and Prof. John Gattorna. These and other contributors have all collaborated with NITL over the past decade. Their contributions will be based on leading edge thinking and research in their respective fields but aimed squarely at a largely practitioner readership.

To purchase the earlier book visit www.blackhallpublishing.com.



NITL Welcomes New Programme Participants

In recent months NITL welcomed over 30 new participants to its Executive Masters programme. All major sectors in the Irish economy were represented with participants from a range of companies including PepsiCo, Apple, DHL and Wyeth. The feedback from participants in relation to the "Introduction to SCM" module was universally positive with comments such as:

- 'Excellent balance of theory and practice'
- 'The tutor's style, passion and knowledge of the subject were particularly good points about the module'
- 'The pace was great with plenty of participation'
- 'Great presentation style with obvious understanding of the subject matter by tutor'
- 'This is exactly what I want to learn – thanks!'

NITL wishes all new participants well in their studies.

For further information about NITL's learning programmes, contact Antonio at 01-4024023 or adelinares@dit.ie or visit http://www.nitl.ie/Learning/Default.9.html.

NITL Student Awarded Posthumous M.Sc. in SCM

The degree of Master of Science (M.Sc.) in Supply Chain Management was conferred posthumously on James Kearney recently by the Dublin Institute of Technology (DIT). Jim sadly passed whilst in the final stages of his Masters studies. He was a senior supply chain professional in the HSE, a role to which he brought his inimitable professionalism, knowledge and warmth. The conferring took place at the HSE in Dr. Steeven's Hospital in Dublin with DIT/NITL represented by Edward Sweeney and Claudia Wagner.

NITL staff knew Jim since the Institute's inception in 1998, mainly as a result of his involvement in the Irish Institute of Purchasing and Materials Management (IIPMM). A few years later the relationship became somewhat more formalised when Jim joined NITL's Executive Masters Programme in Supply Chain Management. At the conferring Edward Sweeney commented that 'Through participation in programme modules Jim's passion for the subject shone through. During modules he engaged vigourously, challenged the conventional wisdom and was participative in manner which was exemplary. Of particular note was Jim's willingness to share his wealth of knowledge and experience with younger participants.' Ar dheis De go raibh a anam.

Claudia Wagner and Edward Sweeney of NITL at the Conferring Ceremony

Jim's widow, Ann, his children and a number of other family members were in attendance at the conferring, as were several former HSE colleagues. NITL would like to thank John Swords of HSE for facilitating the event.

NITL invited to support economic development in Naples

NITL has been invited to support economic development in the City of Naples, with specific reference to SCM and logistical issues. During his recent visit to Naples, Edward Sweeney met the Mayor of Naples (Rosa Russo Iervolino) and the Minister for Economic Development (Mario Raffa) to initiate this work. In addition to this work Edward delivered a lecture entitled 'Supply Chain Management and Logistics in the 21st Century' to over 200 invited guests at the University of Naples "Federico II" as part of the Italian launch of his book *Perspectives on Supply Chain Management and Logistics*. He also led a research seminar on the theme of 'Extended Enterprise, SCM and Logistics'. Academic staff from University of Naples "Federico II", University of Naples "Parthenope" and IRAT-CNR (part of the the Italian National Research Council) are continuing their collaborative work with NITL in the areas of ICT in Extended Enterprises and the role of SCM in regional economic development. NITL looks forward to further fruitful collaboration in Italy in 2009.

Recent M.Sc. Graduates in Supply Chain

Edward Sweeney of NITL photographed with Marita O'Connor at the graduation

Sixteen graduates of NITL's flagship M.Sc. programme in Supply Chain Management were conferred recently in St. Patrick's Cathedral at the DIT Faculty of Engineering graduation ceremony. Offering his congratulations to them on their achievements, Edward Sweeney of NITL commented that, "This is a significant achievement and places NITL at the forefront of executive postgraduate education provision". This group of graduates represents a broad spectrum of Irish business and includes supply chain professionals from companies such as EMC, Genzyme, Analog Devices and Boston Scientific. The public sector was represented by the HSE and the Defence Forces, with both of which NITL has longstanding relationships.

NITL wishes all graduates well in their future endeavours and looks forward to a continuing association with them through its alumni activity.

NITL congratulates its latest Ph.D. Graduate

NITL marked another important milestone in its development with the award by DIT of a Ph.D. to Claudia Wagner who works as a Senior Researcher at the Institute. Dr Wagner's research was undertaken at NITL under the supervision of senior NITL academic staff. Her Doctoral thesis was entitled 'The impact of Business-toBusiness E-Marketplaces as Extended Media in the Procurement Supply Chain of Airlines'.

The primary contribution of this work was to provide an original starting point for a more structured focus to improve understanding of the adoption process and value creation of B2B e-Marketplaces. The work has resulted in several publications in leading international academic journals. The foundation provided by Dr Wagner's thesis allows for further robust investigation in this field. Indeed, Dr Wagner is carrying out some of this work as part of her ongoing research activity within NITL.

NITL views postgraduate research as a fundamentally important part of its overall portfolio of activities as it enables the Institute to make a positive contribution to the body of knowledge in the logistics and supply chain fields.

NITL would like to congratulate Claudia on her fine achievement and looks forward to further success with its research student population in the not too distant future.

NITL at International IPSERA Conference

NITL staff recently attended the annual conference of the International Purchasing and Supply Education and Research Association (IPSERA). This year's event took place from April 5-8 and was hosted by the European Business School (EBS) located in the Rhinegau Region in Southern Germany.
IPSERA is a multi-disciplinary network of academics and practitioners dedicated to the development of knowledge concerning purchasing and supply management. It is the world's biggest and most internationally oriented platform for researchers in this area. The annual conference provides exposure to some of the most recent developments in this field. The conference theme "Supply Management – towards an Academic Discipline?" attracted around 250 researchers from all over the world.

NITL has a longstanding involvement in IPSERA and was involved in hosting the event in 1999. We were represented at this year's event by Dr Claudia Wagner and Colm Ryan who is a graduate of NITL's Executive Masters programme and who now works as a program manager at Apple Inc. based in Cork. The title of their paper was:

Digital Supply Chains: Towards a Framework for Software Distribution by Colm Ryan (Apple Inc), Claudia-Maria Wagner (NITL), Edward Sweeney (NITL), Emilio Esposito (University of Naples *"Federico II"*) and Pietro Evangelista (University of Naples *"Federico II"*).

NITL sees continuous collaboration with industry and other leading academic institutions as a key element of its research endeavour. The paper presented at IPSERA is the result of ongoing joint research activity between NITL and the software industry, as well as with Italian academic partners.

Further information about the event is available at http://www.ipsera.com

Delegates at the recent IPSERA conference in Germany

Irish companies see China as a land of opportunities

A business survey commissioned by supply chain services specialist, SerCom Solutions, highlights the strong interest among Irish based companies in developing trading links with South East Asia and in particular China. Despite the current economic recession, over 80 per cent of survey respondents see China as an opportunity for business as opposed to a threat, with 57 per cent of companies surveyed, currently doing business in Asia, in some shape or form.

The survey, which was conducted by the research team at the National Institute for Transport & Logistics (NITL), also set out to gauge the need for supply chains that are both sustainable (i.e. environmentally friendly, with reduced CO_2 footprint, less damaging to natural resources) and resilient (i.e. commercially efficient, robust, and meeting customer needs at an economic price). Being green and commercially efficient should not be mutually exclusive.

While the majority of companies surveyed (67 per cent) rate their company's environmental performance as strong or very strong, almost 80 per cent agree that environmental and sustainability issues are likely to become more critical in the years ahead. According to respondents of the survey, some of the environmental/sustainability initiatives likely to be introduced in the near future, include the use of alternative energy sources such as bio-fuels in transportation and the introduction and use of more biodegradable materials in products.

As supply chains become more complex as a result of global sourcing and the continued trend to 'leaning-down', supply chain risk increases, and with this, the need to create more resilient supply chains becomes ever greater. Based on the survey's findings, over 75 per cent of respondents stated that SCM resilience issues will become more critical as businesses today increasingly need to grapple with managing and mitigating a whole range of risk factors impacting on the business.

This survey has attracted a lot of media interest in recent months. For example, there were reports in:

Electric News
11th February 2009

Limerick Independent
22nd February 2009

EnviroSolutions
23rd February 2009

Business and Finance
March 2009

About SerCom Solutions

SerCom Solutions acts as a global outsourcing partner to many of the world's leading ICT companies. These companies are increasingly outsourcing key aspects of their supply chain in order to achieve shorter lead times to market, reduced inventory levels and more cost effective and efficient distribution.
Established since 1978, SerCom Solutions delivers a comprehensive range of outsourced supply chain services, covering kitting, supply chain planning, order and warehouse management, product sourcing, procurement services, distribution and logistics management.

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USEFUL WEBSITES

By Erica Staller

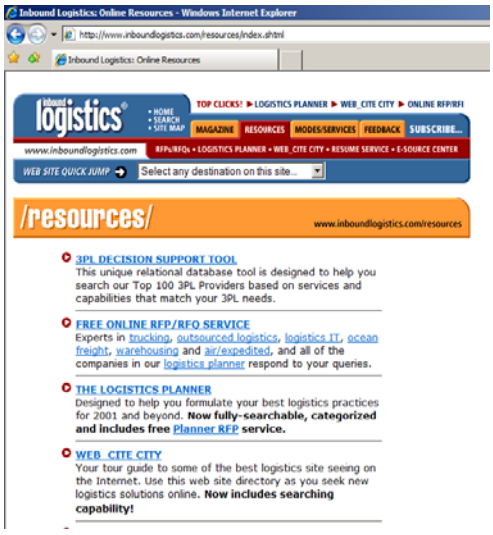
Materials Management and Distribution— www.canadianmanufacturing.com/mmd/

Materials Management and Distribution claims to be Canada's authoritative supply chain management magazine. *MM&D's* goal is to educate and inform readers about current trends and effective practices in supply chain management. The website allows access to past issues of *MM&D's* publication, a free e-newsletter, information about new products and services on the market and a career resource center. While some of the current events presented in the e-newsletter and the publication are geared towards those with Canadian business interests, many of the articles present information that is much more generally applicable concerning trends in supply chain management.

Material Handling Management — www.totalsupplychain.com

Material Handling Management is a magazine which provides inspiration, knowledge and information for professionals involved in material handling. The website provides access to daily features, the monthly publication and archived articles, information about new products, case histories, white papers, events and a career center. The articles are well written, informative, provide useful tips and keep up with current trends in SCM. The website itself has a pleasing layout and is easy to navigate. Searching for information about a specific topic is easy as well; there is a list of popular and specific topics on the left of the page or a search function that returns relevant results. It is $100 for a print subscription of this magazine, $20 for an online subscription and the e-newsletter is free.

Inbound Logistics — www.inboundlogistics.com



The idea behind *Inbound Logistics* is to give supply chain professionals the tools and information they need in order to find solutions and create wealth for their companies. The website is designed to complement the magazine. The magazine features case histories, industry overviews, current issues and trends in SCM and opinion pieces by industry professionals. There is also a how to section designed to give best practices and answer questions. The website on its own features a 3PL decision support tool, career services and information on market leaders. While this magazine is geared towards keeping North American companies competitive globally, there is still a lot of useful information for those who do not do business in North America. The digital edition of *Inbound Logistics* is free.

Erica Staller is based at Arizona State University and is a former visiting researcher at NITL.

The Credit Crunch – A Supply Chain Perspective

Des Lee

Dramatic changes in the world-wide financial system continue to ripple through the global economy affecting credit in all its forms to individuals, small and medium sized companies, large corporations and even governments. The credit crunch can be viewed as a supply chain failure. In this case, the financial supply chain has succumbed to systemic failure, despite most of the elements of that supply chain being compliant, careful about risk and reasonably prudent in the conditions that prevailed. The fact that finance is the most globalised supply chain should give us all pause for thought. Here is a simplified guide to how it happened.

The story of the credit crunch starts with the banks.

A bank acts as a distributor of money and is an integral part of the financial supply chain; it takes in cash from its suppliers and distributes loans and other financial products to its customers. The sources of supply (the sources of money) are retail deposits (bank accounts of people like us); commercial bank accounts (of companies), long term debt (which typically accounts for a small amount of the overall funding) and wholesale funding (from money markets, other banks, companies with excess cash, etc.). Wholesale funding is short term, with maturities from overnight to 12 months and represents the majority of funding for most banks. Banks have a permanent tension between the timescale of their funding (mostly short term) and the timescale of their lending (mostly long term). As a result, they have a constant need for new short term funding as existing funding matures.

Figure 1 below shows the banks, their sources of funds and their assets i.e. loans.

Banks are commercial organisations that are owned by shareholders who expect a return on their investment. Banks make loans (and sell other products) at a rate of interest and the difference between the cost of funds and the interest rate on a loan is the bank's margin.

Assets	▪ **Loans (Mortgages, Term Loans, Credit Cards, Overdrafts, etc)** ▪ **Securities** ▪ **Deposits** ▪ **Investments**
Liabilities	▪ Money markets – short terms funds from those with surplus cash e.g. other banks, large companies, large investment funds ▪ Retail deposits – bank accounts of personal customers ▪ Commercial deposits – bank accounts of companies (tend to be larger amounts) ▪ Long term borrowing, bonds, etc.
Financed by	▪ Shareholders' capital ▪ Accumulation of retained earnings

Figure 1: Bank Balance Sheet

A bank's balance sheet has loans as assets; and deposits as liabilities – the reverse of most companies. Note that for a bank, money is both a measurement of value and profit, as well as of inventory.

There are two sets of regulatory limits on bank activities: one is called capital adequacy, the other is a reserve requirement. Capital adequacy requires that capital and reserves (shareholders' funds) must be a minimum percentage of the overall balance sheet – currently about 6% but will probably rise. Note that as asset values fall, and loan values are written down, this capital is eroded. The second restriction, the reserve requirement, requires the banks to keep a certain percentage of their deposits in cash or securities – they cannot lend all their deposits. These limits are intended to restrict imprudent behaviour by the banks that would jeopardise depositors' money. For more than 10 years, wholesale money markets around the globe have been awash with cheap money – interest rates have been at historical lows and there have been many sources of excess cash e.g. petrodollars, trade surpluses from China, savings from Asian depositors and elsewhere. This easy availability to the global banking system encouraged the loosening of lending standards – the more money that was lent, the more profit could be made. But, the reserve requirement restricts the growth of lending and there were opportunities to further lending as well as funds available; but only if the reserve requirement could be got over. A class of financial products know as Asset Backed Securities enabled this to happen. Banks created securities (financial products) from pools of assets (loans), split the resulting pool into pieces, and sold them to eager investors. In an example from the US, 2710 mortgages with a total value of $450m were packaged as a property investment and sold in, say, 1000 parts, each worth $450,000. The bank takes a fee for selling the product and for continuing to administer the mortgages (payments, etc.). The investors get controlled exposure to the property market with a perceived low risk. The other major advantage for the bank is that selling these securities removes the loans from the bank's balance sheet and allows the money to be recycled to create further loans and further profits.

There is a risk involved in any financial product whose value is based on a promise to repay – the possibility that the repayment may not occur. Financial loan-based products can be assessed for risk by a rating agency. There are three global rating agencies – Moody's, Standard & Poors, and Fitch - who assess the likelihood of default (non-payment) and assign a code e.g. AAA, to denote the quality of the debt. The rating

agencies are paid by the organisation that is issuing the product (a clear conflict of interest). Mortgage backed securities were rated highly – they looked very safe due to the spread of mortgages within each package and the seemingly unlikely event of default by a large proportion of mortgage holders.

The investment rules of many organisations restrict them to buying only investment grade products (those with a high credit rating). Mortgage backed securities received high credit ratings and were bought in large quantities by pension funds, public bodies, universities trusts, local authorities, etc. on the basis that they were a safe investment with a good return and with a spread of risk. Asset backed securities were also held by the banks themselves, who also bought similar products from other banks and from other parts of the world. The returns were attractive and they were seen as diversifying risk away from a bank's core country/sector, etc. - Figure 2 shows securitisation, credit rating and purchase of ABS.

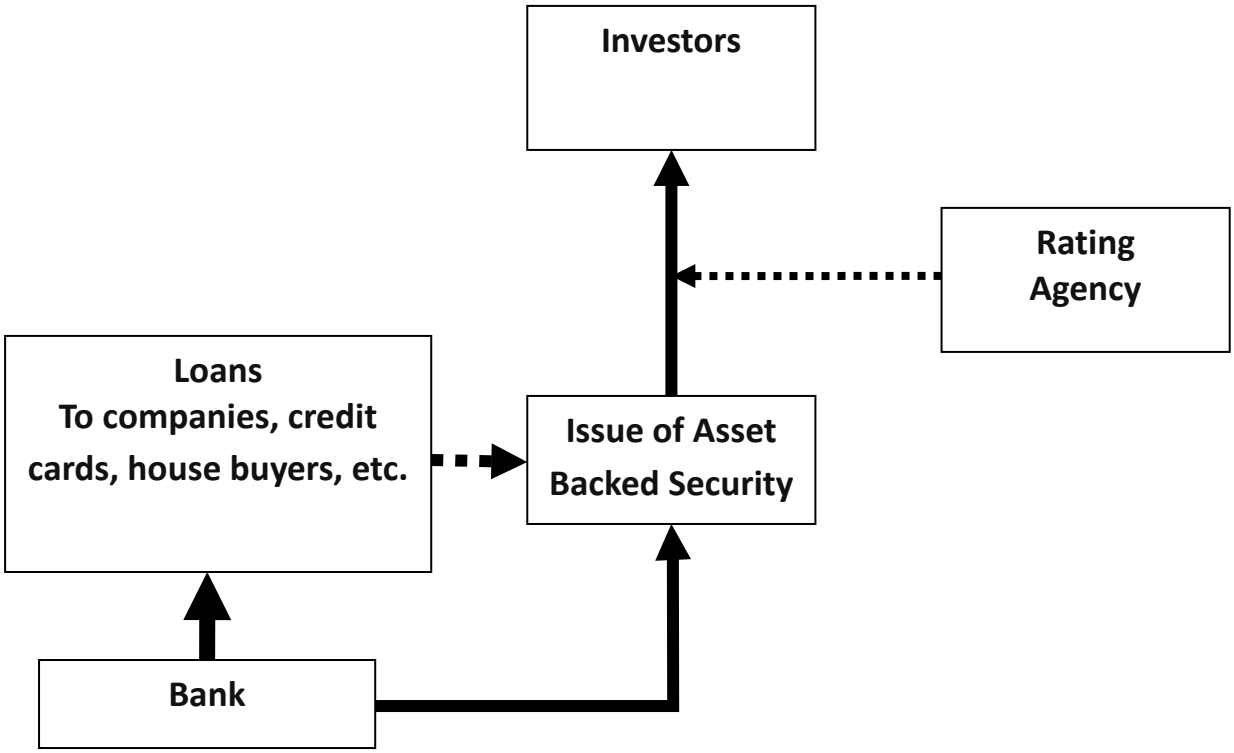


Figure 2: Securitisation

Due to the amount of cheap money available, and to the ability of the banks to remove loans from their balance sheet through securitisation, lending grew at an unprecedented rate. The drive for further profits and the sheer amount of cash available led to a reduction in loan quality – sub-prime mortgages and "liar" loans (with self certification of income) abounded. These were then packaged and sold on. Many of the loans had low "teaser" rates for the first couple of years before resetting to a much higher rate. Everything seemed fine and vast profits accrued until US interest rates started to rise. Between 2004 and 2006, US rates increased by more than 2% on inflation fears. At the same time, the US economy reached its peak and started to slow while many mortgages with fixed "teaser" rates started to reset to more normal (higher) rates. The result was a huge rise in default on sub-prime lending and a sharp downturn in house prices – US house prices are down well over 20% from their peak and still falling!

The management and reduction of risk was a key focus in the entire financial sector and many fancy derivative products were developed to offset risk. As defaults rose (and are still rising) in sub prime loans, the risk reduction derivatives (for example, credit default swaps) were called in. A credit default swap (CDS) is a contract that protects the buyer from default on a loan and acts very much like an insurance policy but without the normal reserves required in the insurance industry. As defaults rose and the CDS's were forced to pay, the counterparties (those on the other side of the contract) faced an avalanche of demands. This put an end to Bear Stearns and to AIG (then the largest insurance company in the world).

Due to the enormous appetite for asset backed securities and the financial products derived from them, many individuals, organisations, funds and banks engaged in borrowing to purchase these assets. The banks were, thus, removing risk from their balance sheets by selling asset backed securities; while at the same time they were buying similar securities from other sources as well as lending so that others could buy similar assets. Risk was being removed by one means, and coming back via another. The complete cycle is shown in Figure 3.

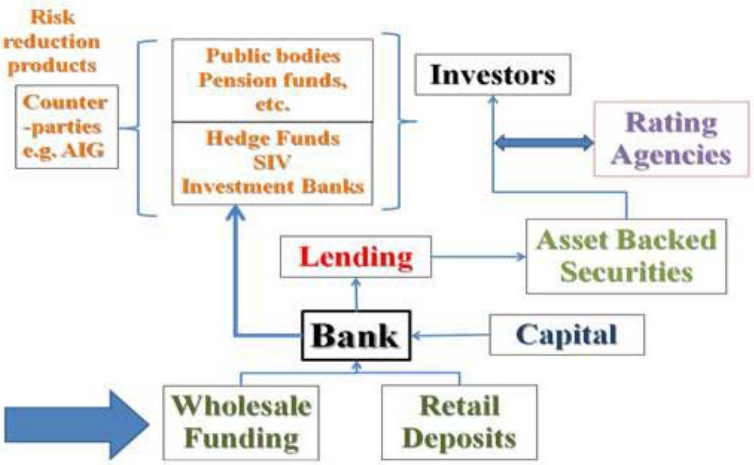


Figure 3: The Whole Sorry Mess!

As the value of asset backed securities and their derivatives has fallen (due to defaults and declining asset values), the financial system has become much more cautious. The vast pool of cash that fuelled the boom has been withdrawn. No one is willing to lend money while they are unsure if they will be repaid. The financial institutions do not know what they own, nor do they know the true value of many of these assets. Until that becomes clear, lending to a bank (via the wholesale markets) will remain difficult. The wholesale money markets that many financial institutions relied on effectively seized up completely at the end of September 2008 following the collapse of Lehman Brothers (one of the large US investment banks), and are still operating much more sluggishly that heretofore.

Governments have attempted to address the problem in three ways:

- *by pumping hundreds of billions into the wholesale money markets – if banks won't lend to each other to cover short term needs, then government will step in. This has been in the form of short term funds, readily available.*
- *by guaranteeing deposits to prevent retail customers from withdrawing their money – no bank can withstand a sustained run on its deposits; and*
- *by putting additional capital into the banks. As banks write off or write down the value of loans on their books, their capital is eroded, which leads the banks to reduce their assets (loans) to comply with capital adequacy. Governments do not want banks to withdraw credit.*

So far it hasn't quite worked. Short term interest rates have dropped from the heights of September, but are still well above normal rates. Credit has been reduced and the excesses made possible by easy credit (mostly in higher asset prices) are being unwound. But falling asset values makes loans more risky and harder to roll over or repay. Many companies have high debt levels and will struggle to repay in a recession. The latest attempts to free up the financial supply chain combine selective nationalisation of the banks; purchase or insurance on toxic (doubtfully valuable) assets; and, as a final resort, the central banks have now started buying government and commercial loans as a means to get money circulating again.

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Supply Chain Physics?

Patrick Daly

You may well wonder what could be the possible connection between the world of natural physics and the world of supply chain management. Well, there is a fascinating new field of study called “social physics” that is actively examining the application of the laws of natural physics to the affairs of human beings. Philip Ball's recent book "Critical Mass - How One Thing Leads to Another" gives a fascinating insight into the subject matter and discusses the science in some detail (Philip Ball, Arrow Books, ISBN 9780099457862).

As Ball explains, one of the most curious of the phenomena that occur in natural physics is what is known as a **Phase Transition**. This happens when, for example, water freezes to ice or boils to vapour. These phase transitions for water happen at what are called critical points in temperature. For water, as we all know, the critical points are 0 degrees centigrade for the solid to liquid transition and 100 degrees centigrade for the liquid to gas transition.

"So what?" you may be saying to yourself. "I am a supply chain manager or a logistics manager, or a company director or whatever, what relevance do phase transitions in natural physics have for me". Well the answer is - quite a lot in fact - read on and I will explain.

The really curious thing about water freezing is that close to the critical point of 0 degrees centigrade, a very small change in temperature can cause the whole system to shift very quickly and completely from one state or phase to another. In effect it is either entirely liquid or entirely solid ice - there is nothing in between and the change from one to another happens all at once in response to an imperceptibly
small change in temperature.

Similarly today, under the strain of recession many businesses and indeed entire supply chains are moving into regions where the organisational "temperature" is getting perilously close to its own particular critical point. And what would natural physics tell us about the conditions close to a critical point? It would tell us that very small changes in this organisational temperature could cause a dramatic and sudden phase transition.

The concerning thing is that this would be a phase transition between survival and prosperity on the one hand and failure and ruin on the other. Close to the critical point small changes in the organisational temperature in the wrong direction will now have big effects shifting an organisation from liquid and flowing to frozen rock solid in the blinking of an eye.

Understandable as it may be given the current economic environment, the tendency to batten down the hatches, suspend all change and action, cut investment across the board and become introspective and defensive could be fatal at this time. This approach, in my opinion, will lead to a small but significant cooling in organisational temperature that, close to the critical threshold as we are, could cause things to freeze up catastrophically.

On the other hand, if the current challenges are viewed as a call to action to create a sense of urgency, if they can be a catalyst to get things done now to make operations more efficient and productive, more effective in delivering value to the customer and more focused on bolstering cash flow, this will maintain the organizational temperature above the critical point. This energy will keep things flowing, guarantee liquidity and prepare the business well to emerge stronger than ever from the tough times ahead.

Those businesses and those supply chains that do successfully stay above the critical point and learn to thrive in the face of challenge will emerge leaner, fitter and stronger than at any time in the past. To be among them, the time to act is now, it is a time to be bold, a time to look for opportunities, a time for conviction, for leadership and for action.

Here are some of the things that you can do to keep your organisational temperature above the critical point:

- Use the recession as an accelerant for action and pull forward planned restructuring
- Seek out multiple opportunities for productivity improvement
- Drive innovation harder and faster
- Streamline processes, removing non value added activities and excess inventories
- Improve focus on measurement systems and key performance indices
- Focus Cap-Ex investments on initiatives with short-term paybacks in the 12-month range
- Maximize flexibility and protect cashflow
- Don't lose site of longer-term investment plans for future growth

And remember, you cannot cut your way back to success, you are going to have to innovate and be creative to thrive and prosper in the face of challenge.

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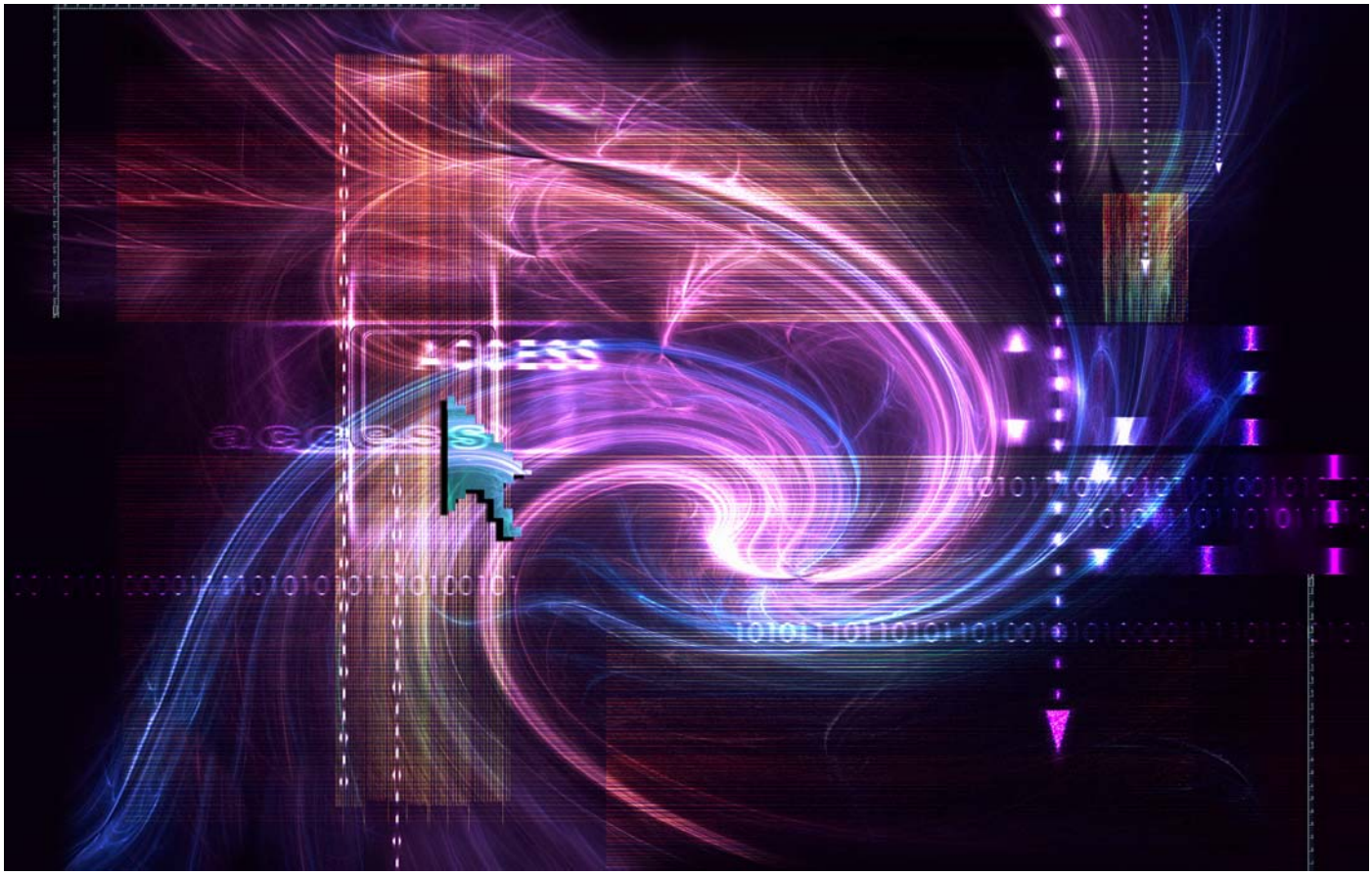

The Transformation of the Software Supply Chain: Challenges for Digital Software Distribution

Colm Ryan and Claudia-Maria Wagner

Introduction

As a discipline, supply chain management (SCM) has traditionally been primarily concerned with the procurement, processing, movement and sale of physical goods. However an important class of products has emerged - digital products - which cannot be described as physical as they do not obey commonly understood physical laws. They do not possess mass or volume, and they require no energy in their manufacture or distribution. With the Internet, they can be distributed at speeds unimaginable in the physical world, and every copy produced is a 100% perfect duplicate of the original version. Furthermore, the ease with which digital products can be replicated has few analogues in the physical world.

Little is known about the effects of the non-physicality of certain goods in relation to SCM practice. This article explores the challenges that arise when managing the supply chain of one such product: software. An extensive literature review and a number of in-depth, one-on-one interviews were held with software distribution practitioners in 8 companies to address these issues.

Characteristics of Digital Products

Before outlining differences and challenges of digital supply chains, the nature of digital products by itself need to be defined. Digital products don't have physical forms or structures and cannot be physically consumed (Choi et al., 1997). Whinston et al. (1997) identifies three key properties of digital goods:

- Indestructibility (the tendency of a digital product to maintain its form ad-infinitum);
- Transmutability (the ease by which a digital product can be modified); and
- Reproducibility (the ease by which digital products can be reproduced, stored and transferred).

The property of reproducibility in particular makes digital products different from physical products. This property has huge consequences so long as there is sufficient storage and bandwidth available to copy, move and transport product – an increasingly valid assumption - (Grochowski, 2003). No raw materials or energy need to be sourced or used up in the process. Replication is instantaneous and no manufacturing facility is required. Thus, economists refer to digital products as having an almost zero marginal cost (Shapiro 1999). However, Shivendu (2008) outlines that while digital products have negligible marginal costs of production, they usually have very large product development costs. However, due to the ease of reproducing digital products, piracy and the protection of embedded intellectual property represents a major challenge.

Successful software distribution is highly dependent on bandwidth on the Internet (Hui and Chao, 2002). Thus, bandwidth constraints remain very significant when distributing digital products. Some software products are very large, occupying many gigabytes of disk space (Chaffey, 2007). Bandwidth typically requires large investment costs and particularly with software products in excess of 2-gigabyte technical problems rapidly increase.

While zero marginal cost of digital products is an advantage from the direct cost standpoint, it also means that market forces will continually act to reduce the price to zero, thus putting pressure on profit margins (Messerschmitt and Szyperski, 2003). Significant costs are particularly incurred in the production of the first software product, however competition from low cost producers have served to reduce these costs greatly. Open source software, the most prominent of these models, employs free software expertise in the production of very competitive products. This serves to push commercial software prices down, challenging incumbents to experiment with new means of generating revenue (Young, 1999).

Copyright protection and software piracy is another major challenge. Software piracy is defined as the unauthorized use, duplication, and distribution or sale of commercially available software (Moores and Dhillon, 2000). What is surprising, however, is that a significant number of companies seem to have relatively relaxed approaches to limiting piracy, and that some have no technological anti-piracy mechanisms whatsoever.

Other challenges affecting software supply chains are outlined in Figure 1. Globalisation challenges represent legal issues and national considerations, such as embargos and licensing in various countries, as well as issues concerning version and configuration issues. With regards to software deployment a strong preference towards the use of engineers and consultants is prevalent in enterprise-focused software companies while installations for consumers tend to be automatic. Technological compatibility has further been identified as a critical challenge. There is a key difference between digital and physical goods in that goods such as software cannot exist without a physical support infrastructure (i.e. hardware) or other software products to be present before it can work properly (Messerschmitt, 2003). Partner-

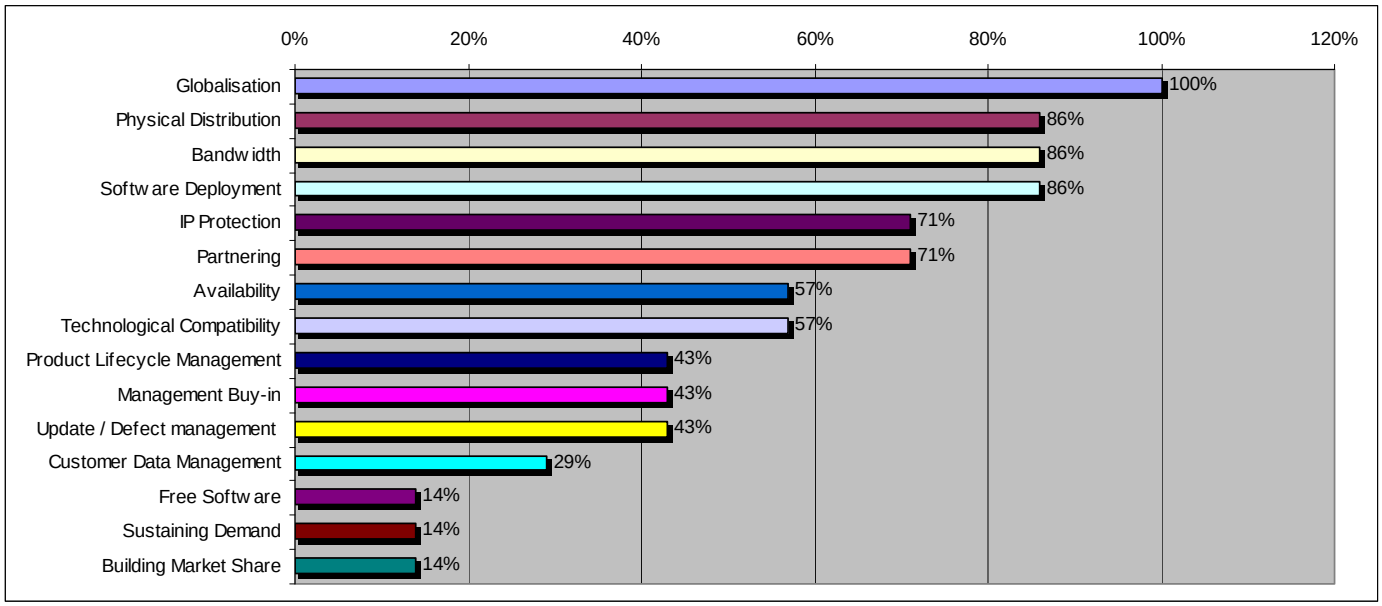

Figure 1: Challenges for Software Distribution

-ing is emphasising on long-term relationships. Further challenges are website availability, product lifecycle management, management buy-in, update and defect management, while customer data management, free software, sustaining demand and building market share have been cited less frequently as major challenges.

The Supply Chain and Distribution of Digital Software Products

Managing the supply chain in traditional markets mainly provides challenges related to cost-effectiveness and physical barriers. By contrast, in a digital marketplace supply chain management encounters barriers that are not physical but rather strategic in nature (Nath, Saha and Salehi-Sangari, 2007). Chou and Ruchika (2006) argue that a digital software-focused supply chain is a supply chain where the digital product (software) constitutes a significant part of the total value of the product and where goods are not physically flowing through the supply chain. In a software supply chain, for example, a significant proportion of the supply chain is comprised by only one entity, which is usually one single company handling the design, development and production of a software product. It is usually at the distribution stage that a software company might engage the services of another company to market its product. Moreover, channel coordination policies such as returns are not applicable in the digital world.

The traditional software product is supplied by physical means, such as a CD. Chou and Ruchika (2006) have identified several stages of a software planning and production process. A cycle time up to three years could be required. The first three stages of the process involve design and development and testing of the software. The next three stages involve preparing the support infrastructure that accompanies the main software product. This might include a user-guide or documentation, media production and other add-on features, as well as the final product rollout. Finally, marketing and distribution, as well as retailing efforts to sell the software ensue.

In the increasingly digitised software industry supply chain, the flow of material is declining in importance, due to the availability of the Internet as a free distribution medium. Research has elicited that a digital product can be characterised as a movement of value instead. Thus, key flows represent information, ideas and innovation, from requirements into development, from release through to distribution and finally to the end-consumer. As such, information is shared mainly through electronic means within and outside of an organisation. Moreover, network technologies have the potential to transform the supply chains of many industries because of the abolition of the trade-off between richness and reach of information, which means that everybody can communicate with everybody at almost zero cost, without constraints on the richness of information. (Graham et al., 2004 cite Evans and

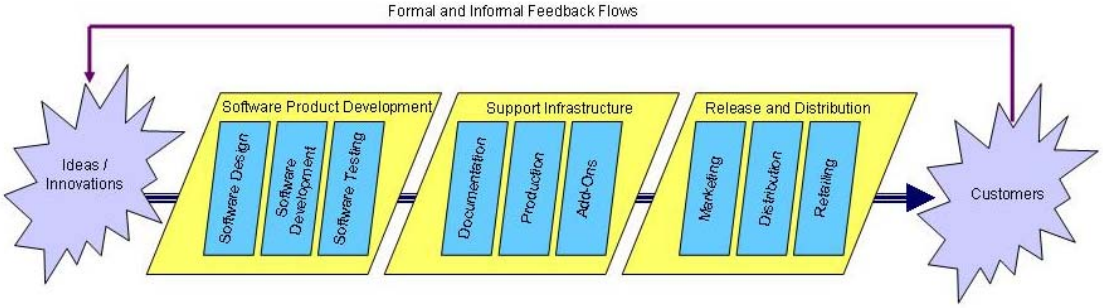

Figure 2: Software Supply Chain Activities and Processes

Wurster, 1997). Richness of information includes characteristics such as bandwidth, customisation, and interactivity. Reach is defined as the connectivity, and is the number of agents involved in exchanging information. Before the Internet, to reach large numbers of people with rich information was a costly and time-consuming process. Traditionally, information could only be transferred in the form of a physical carrier such as a document, book, CD, etc; it could not travel by itself. Therefore, costs and physical constraints limited the size of the audience to which the information could be sent and the nature of the information itself (Graham et al., 2004).

The Internet has an important impact on how software is distributed. Through the interviews three major distribution characteristics could be identified: (1) Physical and pseudo-physical distribution; (2) free distribution; (3) no distribution.

(1) Pseudo-physical distribution

37.5% of the interviewed companies have chosen to pursue the first approach: born out of supply chains, legacy infrastructures and a competitive landscape that was designed to deal with physical product manufacture. Companies pursuing this strategy act to limit supply through technological copy protection measures backed up by legal enforcement. The customer's use of the software is impaired from the outset by highly restrictive licenses that need to be agreed to before the product can be used at all. Then, copy protection measures such as activation keys are included in the software to prevent duplicate copies being made. Complex supply chains need to be developed to support many of these initiatives. For instance, an infrastructure may be required to distribute activation keys in a secure fashion to the correct customers. These processes are complicated where third parties (distributors or resellers) need to be involved. Billing mechanisms may need to be integrated with the distribution mechanisms. Such processes require significant customer support overhead.

(2) Free distribution

In the second approach, few or no controls are imposed on the distribution of software. Some or all versions of the software are distributed to users with few control mechanisms in place. Although, 50% of respondents offered free distribution of some sort, a number of different approaches were used:

The total-service based model. In this model, the software is free to distribute and install. However, associated services such as consultancy, bug fixing, hardware, training, technical support and customer support (all limited in supply) are available to the customer for a fee.

The customised model. In this case, the software is freely distributed. However, the nature of the software is that without extensive customisation, it has little value except to the customer for which it is intended. The companies involved deliver large-scale system installations, where the software requires extensive modification before it can be useful to the customer.

The complementary model. In this case the software is provided to enhance the value of a physical product such as computer hardware.

The premium enticement model. While basic or limited copies of a version of software are made available at no cost, an incentive is provided enticing users to upgrade their software to a premium version that is charged at a cost. This premium version may contain limited supply features (e.g. a 24x7 support hotline).

(3) No distribution

The third approach avoids the need to involve product replication at all. In this case the "infinite availability" of software is comparable to a resource such as electricity or water and is made accessible whenever and wherever the user desires it. In the Software-as-a-Service (SaaS) type model, a single instance of software is shared amongst multiple users. Replication is therefore not required. This model is gaining currency over the past few years as bandwidth (speed and market penetration) has increased and concerns over data security are addressed. However, just one company among the interviewed firms was using this approach.

physical product distribution.

While this research reveals that physical and pseudo-physical distribution approaches remain important in the software distribution process, two new supply chain scenarios are emerging. Both scenarios assume that manufacturing and distribution are of minor importance in the world of digital products, and that the right software is instantly available whenever it is required.

⇒ Hybrid physical / digital / service supply chains. In this scenario, the supply or availability of digital product becomes integrated into a more comprehensive supply chain strategy involving physical supply and service-based elements.

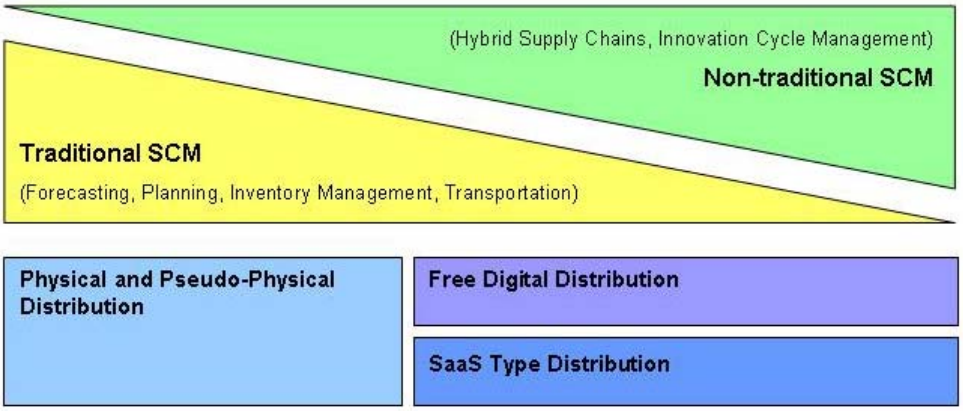

Figure 3: Changes in SCM requirements over the spectrum of digital distribution approaches

Discussion and Conclusions

The research has identified three different classes of software distribution models: one, which tends to rely on traditional physical infrastructures and paradigms, and two others that better exploit the properties of the digital products. Approaches, which are comparable to physical distribution, tend to require significant management overhead (forecasting, inventories, copy-protection, license management, bandwidth management, etc.), whereas less traditional management processes are required for free and uncontrolled distribution over the Internet. In other words, from a traditional SCM standpoint, there is a variation in complexity according to the degree to which digital product distribution is made to resemble physical

Hybrid distribution leverages the advantages of digital products to improve the performance of more traditional supply chains.

⇒ Innovation Cycle Management. In this scenario, the focus moves from the flow of product to the flow of innovation (e.g. ideas, software code, executables, feature suggestions) from first conception, to development, to release, and distribution into the hands of the customer. It is seen as a cycle because the flow of feedback back from customers (a kind of reverse logistics process in the digital world) is crucial to further innovation and new releases of product. The focus of SCM migrates from operational concerns to product development and lifecycle management considerations. This challenge is complex because development is

increasingly fragmented amongst different groups (in-house developers, off-shore developers, contractors, specialists etc.), and customers can vary enormously in terms of their requirements, processes and feedback mechanisms.

To summarise, digital products such as software will affect the practice of SCM greatly over the coming years. While pseudo-physical distribution strategies, such as the use of copy-protection, are unlikely to disappear in the near term, it is likely that companies will leverage the free replication properties of digital products to enhance their current supply chains, and that they will put greater focus on the management of innovation cycles to drive the maximum amount of differentiation and value from their products.

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Collaboration: A Key Competence for Competing in the 21st Century

Umit Bititci, Peter Butler, William Cahill and Denis Kearney

Introduction

It is now an accepted fact that in the 21st century competition will be between networks of organisations and individuals, which efficiently and effectively integrate their competencies and resources in order to compete in a global economy (Bititci et al, 2004). Similarly the SME'2000 conference, which was held in Bologna, concluded that "*SMEs belonging to networks are often more competitive and innovative than those operating in isolation. When working together, SMEs can increase their focus through specialisation in functions that are complementary within their networks*".

In today's global economy, companies are trying to re-invent their businesses and maintain their competitive advantage through collaboration by sharing resources, information and risks. However, despite the fact that collaboration has significant benefits, earlier studies report high failure rates amongst collaborative companies (Lewis, 1990; Elmuti and Kathawala, 2001; Zineldin and Bredenlow, 2003). These works identify many factors as the drivers for success and failure (Ohmae, 1992; Kanter, 1994; Das and Teng, 1998; Kalmbach and Roussel, 1999; Huxham and Vangen, 2000; Daniels and Radebaugh, 2001; Child, 2001).

The objective of this article is two-fold:

1. Explain in simple terms what collaboration means, its benefits, reasons for failure and critical factors that need to be considered in creating and managing collaborative enterprises.
2. Share the results of a survey conducted among European SMEs to understand the state of collaborative arrangements and elicit their experiences with regards to collaboration.

The research reported in this article was funded through an EU Leonardo da Vinci project with an objective to facilitate European SMEs to collaborate (see www.SMECollaborate.com for further information on the project)

The Global Landscape

In the 21st century, industry will continue to be about the creation of value through innovation and improvement of products and processes. However, the value content of manufactured artefacts (goods) will be relatively small compared to the value of the service and/or knowledge content associated with the artefact.

It is also considered that the nature of retail will change and some manufacturing activities will start moving into retail operations – for example, with retail outlets configuring products to customer specification, continuously driving towards mass customisation. This will lead to the blurring of lines between manufacturing and retail.

Manufacturing will have to deal with greater degrees of complexity, uncertainty and change as product lifecycles become shorter, multi-science products start to emerge (products with knowledge, IT, biotech, chemical, mechanical, electrical, etc., content); thus sustainability of the productive system (including product design, recycling, returns management) and agility become major challenges. Industry and retail will

have to deal with end-to-end fulfilment processes that include product development, supply chain management, reuse, recycling and end of life disposal. Mass customisation will become more widespread, especially enabled through scalable technologies.

All of these developments will lead to the emergence of knowledge-based collaborative enterprises.

In this context, collaborative enterprises refer not just to supply chains but also to networks and clusters, including collaboration in technology development (technology chain), product development (design chain) and product support (support chain). The collaborative enterprise concept extends the current thinking on supply chains and strategic alliances, where each enterprise tries to maximise its own performance—in a truly collaborative enterprise the performance of the whole system is optimised and gains are shared between the partner enterprises.

Knowledge-based collaborative enterprises will compete, not based on the ability of making a specific artefact but based on its competencies and capabilities in developing a product, marketing and selling the product, making the product, packaging it within a service proposition and customising it to specific customer needs. The collaborative nature of an enterprise together with the need for mass customisation will lead to the development of more distributed industrial systems.
These changes will also affect the distribution of labour and the social systems. Industry and commerce as we know them today will change. Processes will be global and inter-enterprise, consequently teams (operational and management) will span across enterprises and these global teams will be multicultural and spread across multiple time zones. Consequently, a new social system will emerge.
The above changes will be partly fuelled and partly driven by emerging technologies in all areas of science and engineering, but particularly by developments in information and communication technologies, such as exponential increases in bandwidth, standardisation of interfaces and development of more open systems architectures.

What is Collaboration? And Why do Companies Collaborate?

In simple terms collaboration literally means "working together". Bititci et al, (2004) offers a more formal definition of collaboration as "a number of autonomous organisations working together, pooling and sharing resources, information, systems and risk for mutual benefit".

In collaborating, organisations share resources, share & exchange information and complement each other's weaknesses. Literature (Golicic et al., 2003 and Parung and Bititci, 2005) defines different levels of collaboration that are associated with different levels of resource, risk and benefit sharing. These are:

- Coordination – information sharing with little mutual adjustment
- Cooperation – resource sharing with moderate mutual adjustment
- Collaboration – risk and benefit sharing with high levels of mutual adjustment

Literature also provides numerous sources on the benefits of collaboration, which are summarised in

Reduced…	Increased…
• Risks	• Market share
• Costs	• Assets utilization
• Time to market	• Quality
• Delivery time	• Flexibility and responsiveness
• Inventory	• Skill and knowledge
	• Critical mass
Lewis, 1990; Kanter, 1994; Huxham, 1996; Parker, 2000; McLaren, Head and Yuan, 2002; Sahay, 2003; Stank et al., 1999; Holmberg, 2000; Lummus and Vokurka, 1999; Ireland and Bruce, 2000; Kanter, 1994	

Table 1: Typical benefits of collaboration

Based on how the literature defines and classifies collaborative business relationships and the associated benefits of such relationships, it is clear that collaboration provides a mechanism by which risks are shared (thus minimised) and opportunities maximised by bringing together the right mix of competencies and creating critical mass to enhance an organisation's competitive advantage.

Why do Collaborative Ventures Fail?

Evidently, many studies report that, although the number of collaborative enterprises is increasing, 70% of collaborative enterprises end up in failure (Lewis, 1990; Harbinson and Pekar, 1998; Zineldin and Bredenlow, 2003).

The literature contains a number of examples that typify why collaboration fails. The most commonly quoted examples include: Honeywell and Ericsson (Zineldin and Bredenlow, 2003); Ikea and its suppliers (Zineldin and Bredenlow, 2003); NWA and KLM (Elmuti and Kathawala, 2001; Zineldin and Bredenlow, 2003); GM and Daewoo (Zineldin and Bredenlow, 2003), Volvo and Renault (Bruner and Speckman, 1998; Elmuti and Kathawala, 2001).

Previous research (Bititci et al, 2004) identified several reasons that may cause a collaborative enterprise to fail. These reasons are categorised as follows:

- Failure to achieve **Strategic Synergy** – to ensure that participants have a common appreciation of the individual objectives and expectations of one another, which are consistent with the competencies and contribution of each partner, as well as the additional value and competitive advantage to be delivered through the collaboration.
- Failure to achieve **Operational Synergy** – to ensure that each partner's internal management difficulties are understood and resolved, and that customer focused operational systems extend across organisational boundaries.
- Failure to achieve **Cultural Synergy** – to ensure that the mindsets, organisational culture and management styles are compatible between partners and that there is sufficient trust and commitment among partners.
- Failure to achieve **Commercial Synergy** – to ensure that the short and long term expectations, benefits and risks are understood and appropriate agreements have been put in place with regards to the distribution of risks, as well as benefits arising from collaboration.

The literature makes it clears that collaborative relationships between businesses provide a mechanism for quickly responding to global changes and pressures whilst building competitive advantages for competing in this rapidly changing global economy. It is also recognised that, while large companies can rely on internal resources for technology, product, market and competency development needs, SMEs, with their limited resources, need to work with others in order to develop competitive positions in a global environ-

What do European SMEs say about Collaboration?

In 2007, a survey of European SMEs was conducted by Partners in the SMEcoll project (www.smecollaborate.com). The survey was conducted in two stages. The first stage involved the completion of a questionnaire to establish the collaborative profile of the population. This was followed by face-to-face interviews with selected SMEs from these states. In this section we present the results of this survey.

Questionnaire Survey

The questionnaire was distributed by post and email post to approximately 500 SMEs across the five European countries that participated in the project. In some countries the questionnaires were followed up with telephone calls to elicit responses. In total, 108 usable responses were returned (28 from Ireland, 11 from UK, 9 from Germany, 42 from Italy and 18 from Sweden).

When asked of their experience of collaboration, 82% of the respondents reported positive experiences, implying that they had participated in some form of collaboration and, as a result, they had positive experience of collaboration. 16% indicated that they had no experience of collaboration but were interested in finding out more. 1% reported negative experience, implying that they had participated in some form of collaboration but with unfavourable results. 1% of the respondents reported that they have no experience and that they were not interested in collaboration (Figure 1a).

Respondents were asked what types of partnerships were preferred. Four different types were defined, each of which involves deeper levels of involvement:

Cooperation involves being a 'good neighbour' and sharing information.

Coordination involves resource and systems sharing, such as joint marketing.

Collaboration involves interdependency with risk and benefit sharing, such as new product development.

Vertical Integration involves a tight partnership, such as in sectoral supply chains.

It was not surprising that cooperation was deemed as the most important (33%). Significantly, collaboration was almost as important (30%) among the respondents. Co-ordination was deemed as of lesser importance (22%), while Vertical Integration was of lower priority (15%). (Figure 1b).

Respondents were asked to select from a list of business processes or business areas what their primary and secondary priority areas were for potential collaboration with others. Three areas stand out – anything that will help increase sales; the ability to be able to access new markets; and the capacity to develop new products. Accessing technological capability and new skills were also seen as important, while general improvement projects, e.g. productivity or quality improvement, were less important.

When asked of the location of their collaborative partners, 45% reported relationships within national boundaries, 35% reported relationships with North American and Western European companies, 7% had relationships in Eastern European with 13% reporting relationships with the rest of the world, including the emerging low-cost economies (Figure 1d).

When asked to categorise their level of satisfaction with collaboration projects that they had undertaken, respondents expressed generally good satisfaction with the overall results, the collaboration process used, the quality of their own contribution and that of their partners and the overall level of goal achievement. (Figure 1e). Similarly, when questioned on more measurable and tangible performance drivers (such as impact on sales, costs, productivity, quality and so on) the respondents reported general satisfaction with the results, although this was not universal. (Figure 1f).

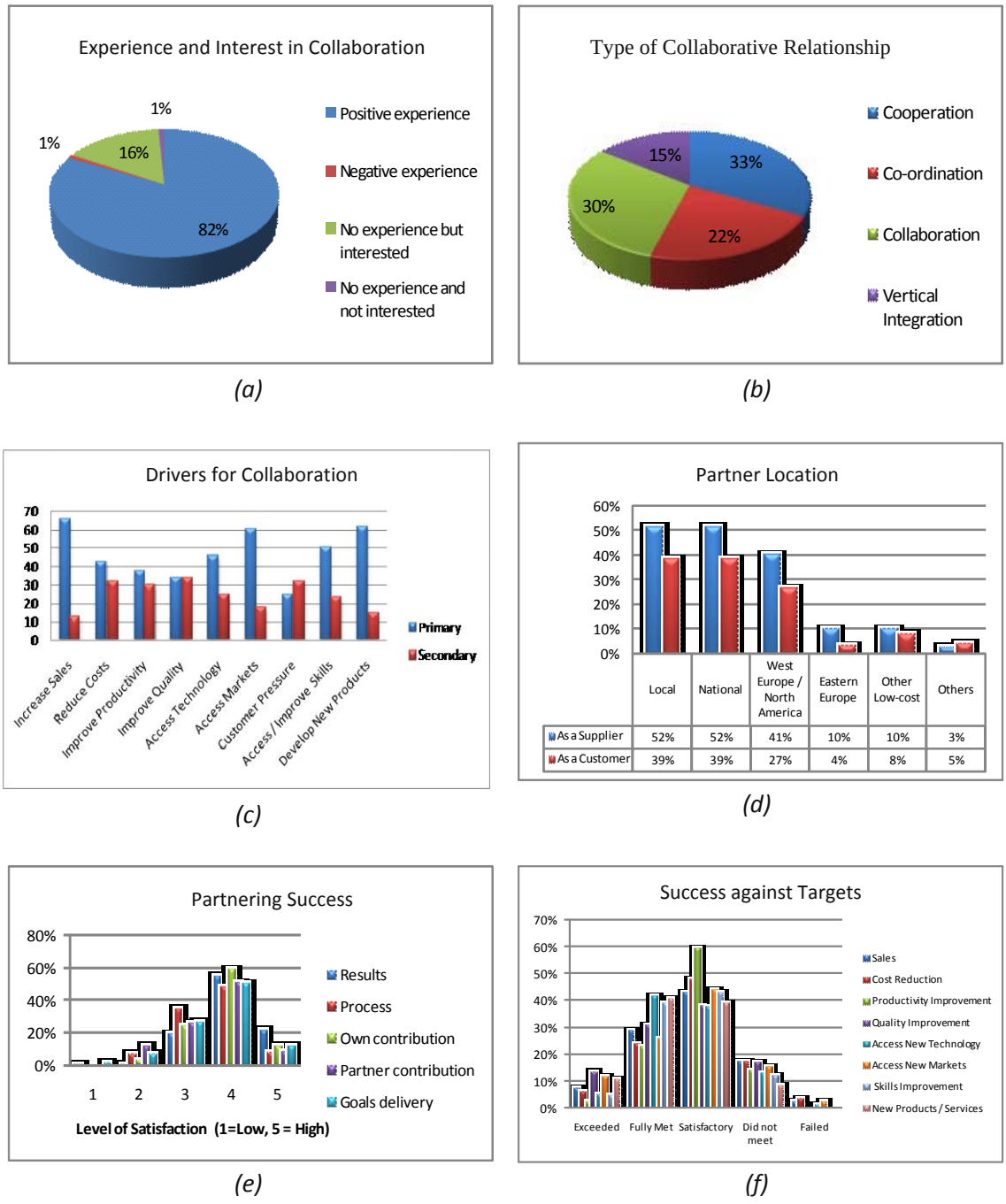

Figure 1: Collaborative profile of European SMEs

Interview Survey

From the analysis of the results of the questionnaire survey, a select number of companies were interviewed from each country. These were primarily those organisations that had exhibited good experience in collaboration. In addition, a number of other companies from outside of this group that did not believe in collaboration were also interviewed.

In total, interviews were carried out with 24 companies (5 in Ireland, 5 in UK, 3 in Germany, 5 in Italy, 4 in Sweden and 2 in Switzerland). The key messages that emerged from these interviews are illustrated in Table 2.

Key Issue	**Trust** There is a clear need for mutual trust to make collaborations work	**Relationships** The need to establish good working relationships	**Communications** The need for managed and clear communication	**Culture** The need to be aware of and overcome cultural differences	**Setting up** In setting up the partnership there is a need for structured and proven methods	**Operation** The need for operational tools to make collaborations work	**Problem Solving** The need for a shared approach to problem solving
Dos and Don'ts	Be an 'Open Book' Do not undermine partner's business No hidden agendas Everyone needs to be a winner Start relationship with something simple Avoid adversarial relationship Do not take advantage of partners	Build a strong relationship between the internal champions in each partner Ensure strong involvement by each partner	Use all possible communications channels to build trust Be willing to share information	Cultural differences will always be present Develop an early understanding of cultural differences Work with partners to mitigate against cultural differences	Use available tools to help find partners Ensure size compatibility Ensure goal congruence Understand partners' goals & problems Ensure clarity through measurable targets Use written agreements Each partner should understand other's roles and competencies Understand limitations of each partner Combined competencies should give something greater than the sum Do not underestimate the man-management effort required Ensure the pace of collaboration development suits all partners	Clear traceability among partnership. Train the collaborating team in teamwork and social skills to Invest effort to make the partnership work Strong should mentor the weak Act as if working for the same business and treat people accordingly Share personnel if possible Spend time in each other's organisations	Do not blame – it is easy, but is destructive to the relationship Need a clear way to identify problems and to tackle them Identify problems early Be up-front with problems Focus on solution first and then look at how to prevent them re-occurring

Table 2: Key messages emerging from the interviews

Overall Conclusions of the Survey

Based on the responses to the questionnaire together with the face-to-face interviews held, the following are the principal conclusions:

- Although European SMEs seems to be familiar with business to business collaboration (82%), mostly with positive results, many of these seems to be cooperative or coordinating relationships rather than full collaboration (30%) where risks and benefits are shared.

- European SMEs seem to be aware of the potential benefits of collaboration, particularly those relating to increasing market opportunities and new product development.

- Most European SMEs seem to prefer forming collaborative relationships within national boundaries (45%) or with partners in Western Europe or North America (35%). In contrast, the survey reported a low level of relationships with other parts of the world (20%). From our interviews, the primary reason for this is the priority given to trust and relationships by SMEs, combined with the need to operate in an open and blame-free way. This emphasises the need to put effort into finding the right partners and understanding their needs, as well as constructing sound operational processes with clear and focused goals, and good communications backed up by measurement and reporting systems.

- Based on the data collected there does not seemed to be a significant difference between the attitudes of SMEs in different European states. However, the interviews did display an increasing tendency for SMEs from Ireland to develop relationships with low cost production economies (such as Eastern Europe and China). A similar tendency is noticed between Northern Italy and Romania. We expect that these trends will accelerate.

The SMEcoll Project

SMEcoll is funded by the Leonardo da Vinci programme within the European Commission to help SMEs to collaborate in today's increasingly volatile global economy. The objectives of SMEcoll is to facilitate SMEs to identify partners, locally and globally, explore collaborative opportunities and develop collaborative relationships through proven methods, tools and techniques, as well as providing a secure environment for managing collaborative workflows.

The project has eleven partners throughout Europe, including Switzerland, Germany, Ireland, Italy, Scotland (UK) and Sweden.

SME Collaborate, together with its predecessor SMEexcel, has developed the following methods and tools:

- The Synergy Model – for assessing the collaborative readiness of an organisation.
- Collaborative attitude assessment tool
- The SME Excel methodology for facilitating and developing collaborative relationships. This takes an organisation through the Attraction, Identification, Formation, Implementation and Evaluation phases of the collaboration lifecycle.
- A number of on-line application tools or simple spreadsheets for evaluating the attractiveness of particular collaborative opportunities
- A secure web-based ICT platform where collaborating organisations can manage their collaborations through a one-stop web-based interface. Collaborations across different regions and time zones can access the collaboration web space on a 24/7 basis. The ICT platform offers the following facilities:

- ◊ Share documents and information
- ◊ Managing workflows to facilitate their collaborative business processes. For example, collaborative preparation of a quotation for a given request for quotation
- ◊ Share a common collaboration calendar
- ◊ Manage collaborative projects using simple project management tools
- ◊ Link to additional resources for collaboration
- ◊ Display ongoing announcements specific to the collaborating companies

In addition to the above, SMEcoll has developed educational materials and programmes specifically targeted at managers, directors and owners of SMEs. For further information, visit www.smecollaborate.com

The following insets contain two case studies on collaboration amongst SMEs facilitated through the SME Collaborate project.

Case of Houston Co-Pack and JW Hardie

Houston Co-Pack is a bonded warehousing and contract packaging operations that specialises in taking the difficult to do jobs from the spirits industry and packages these for major customers, such as Allied, Pernod and Diageo. It identified the need for larger facilities and investment in a modern bottling line as a key priority for growth but could not invest alone due to associated risks.

JW Hardie are owners and managers of well known whisky brands, such as Talisman, Tomatin and Antiquary and were looking for reliable and dependable bottling facilities but could not justify investing in a full new facility due to limited volumes.

Houston Co-Pack was interested in exploring collaboration to grow its business. Facilitated through the SME Collaborate project, Houston Co-Pack identified two potential partners, JW Hardy and Company X, through their industry network. The three organisations were facilitated through the Attraction and Identification phase of the SME Collaborate methodology that resulted in one partner dropping out. Houston Co-Pack and JW Hardy were facilitated through the Formation and Implementation phases of the collaboration process.

As a result Houston Co-Pack installed a new bottling facility to produce 100% of JW Hardie's production. JW Hardie contributed 50% towards the costs of a new manufacturing facility. Houston would also procure dry-goods (bottles, labels, etc) for Hardie, in effect becoming and extension of Hardie's business whilst maintaining autonomy and freedom to win business from other customers.
Repetition.

Case study of RTR Electronics and Quanta

RTR Electronics is a knowledge-based Company, which provides specialised Electronic Manufacturing, Rework Test and Support Services to OEMs globally. RTR's mission is to provide the Electronics Industry with a Best-in-Class Manufacturing, Rework and Repairs Services, which is of high quality, flexible and cost effective. It has a highly skilled workforce, which includes Technicians and IPC Certified Rework Operators.

Today, Quanta Computer is the largest notebook computer ODM company in the world. With leading technology and strong R&D, Quanta has become a leader in hi-tech markets.

RTR and Quanta's Irish operations collaborate on the quick turnaround of screening and testing flat panel computer displays for integration into notebook computers for an OEM based in Europe.

Initially, the RTR/Quanta collaboration tested out a pilot version of the SME-Collaborate platform. The pilot version consisted of a collaboration web space where both companies could share documents, manage their contacts and manage their quotation and reporting processes. The quotation and reporting processes were managed through workflows developed specifically for this collaboration. The workflows included automatic email alerts to notify each person in the process of tasks that required action.

The results of the initial testing concluded that the collaboration platform does provide a useful base for collaboration and that the workflows are good for traceability and data management. The pilot testing also concluded that the users were satisfied with the reliability and error free nature of the platform, as well as the compatibility with other systems and applications. The initial testing also concluded that the platform is a good tool for SMEs.

Conclusions

It is clear that collaboration among SMEs is going to be a key requirement for developing and sustaining competitive advantage in the 21st century. European SMEs seem to recognise this; however they also seem to be nervous about entering collaborative relationships outside their comfort zones. It is therefore essential that they are supported with appropriate education, methods, tools and techniques throughout the collaboration journey.

SMEs need to take the collaboration message seriously and look for collaborative opportunities beyond their national boundaries and comfort zones. Similarly, European governments and support agencies need to recognise the fact that SMEs need coaching and guidance as well as support with identification, formation and operation of collaborative relationships, particularly with partners in developing economies. The SMEcoll project offers a set of methods, tools and techniques to facilitate such support.

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