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Open Innovation in Global Manufacturing Supply Chains

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Advanced Engineering and Manufacturing

including Food Manufacturing and Related Industrial Chemistry



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Advanced Engineering and Manufacturing

including Food Manufacturing and Related Industrial Chemistry


Open Innovation in Global Manufacturing Supply Chains

Dr Paul Denton
Mr Alastair McKinna
25th March 2009









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The Network: Overview

- One of 29 Nationally
- All key FE/HE partners
- Employer driven
- 7 Industrial sectors
- Vocational learner focus
- Level 3 to 4 onwards
- College into University

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Meeting Today's Challenges

- Market Liberalisation and Globalisation
- Customer Expectations
- Shareholder Value
- Hungry Competition
- Product and Process Innovation
- Technological Rate of Change
- Social, Stakeholder & Environmental Pressures





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Acceptance of Change

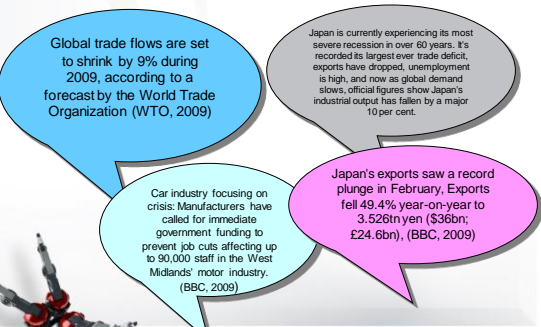
- Heart of 1800's Industrial Revolution
- Combination of Textiles, Mining and Steel Making which allowed UK to export all over the World
- Recent demise of 'Traditional' industry has been replaced by thriving Innovative Creative & Digital Sectors

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Enterprise Doom and Gloom




Global trade flows are set to shrink by 9% during 2009, according to a forecast by the World Trade Organization (WTO, 2009)

Car industry focusing on crisis. Manufacturers have called for immediate government funding to prevent job cuts affecting up to 90,000 staff in the West Midlands' motor industry. (BBC, 2009)

Japan is currently experiencing its most severe recession in over 60 years. It's recorded its largest ever trade deficit, exports have dropped, unemployment is high, and now as global demand slows, official figures show Japan's industrial output has fallen by a major 10 per cent.

Japan's exports saw a record plunge in February, Exports fell 49.4% year-on-year to 3.526tn yen (\$36bn; £24.6bn), (BBC, 2009)



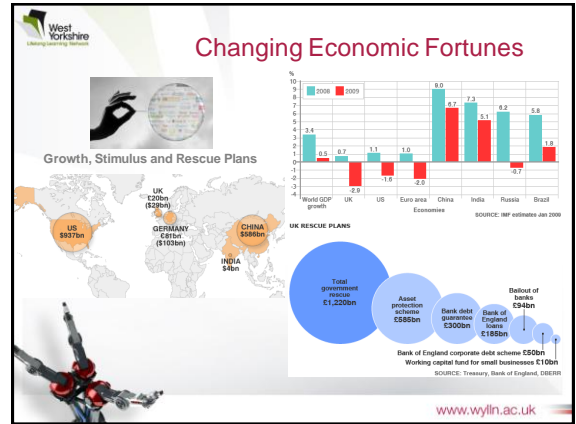
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Relative UK Decline 4th to 6th

	1 USA	2 Japan	3 Germany	4 China	5 France	6 UK
2008	\$14.84 Trn -0.2% Gr 306.6M \$48,400 G	\$5.89 Trn 0% Gr 127.3 M \$41,550 G	\$3.44 Trn 0.2% Gr 82.8 M \$41,550 G	\$4.82 Trn 8.0% Gr 1.34 B \$3,600 G	\$2.73 Trn -0.1% Gr 62.3 M \$43,910 G	\$2.44 Trn -0.1% Gr 61.9 M \$39,470 G
2007	\$14.40 Trn 1.2% Gr 304.8 M \$47,330 G	\$4.96 Trn 1.9% Gr 127.5 M \$38,930 G	\$3.43 Trn 2.5% Gr 82.7 M \$41,400 G	\$3.94 Trn 10.1% Gr 1.33 B \$2,960 G	\$2.68 Trn 1.9% Gr 61.4 M \$43,640 G	\$2.84 Trn 2.2% Gr 60.7 M \$46,740 G
2006	\$13.98 Trn 3.3% Gr 302.1 M \$46,280 G	\$5.29 Trn 2.1% Gr 127.4 M \$41,490 G	\$3.28 Trn 1.8% Gr 82.5 M \$39,710 G	\$3.01 Trn 9.8% Gr 1.32 B \$2,280 G	\$2.52 Trn 1.4% Gr 61.1 M \$41,200 G	\$2.57 Trn 2.7% Gr 60.5 M \$42,430 G
2005	\$13.18 Trn 2.9% Gr 298.4 M \$44,180 G	\$4.96 Trn 1.3% Gr 127.5 M \$38,890 G	\$3.00 Trn 1.6% Gr 82.7 M \$36,290 G	\$2.24 Trn 8.0% Gr 1.32 B \$1,700 G	\$2.28 Trn 1.7% Gr 60.9 M \$37,500 G	\$2.34 Trn 1.6% Gr 60.3 M \$38,860 G

GDP, Growth, Population and GDP Per Head Figures
The Economist 2006-09

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Business Imperatives

For any Enterprise to be successful it needs to maximise the derived value and synergies from its:

- Products and Processes
- Technology and Data
- People and Stakeholders

Achieved Through:
Continuous Improvements to Quality, Speed and Price

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Inevitable Change

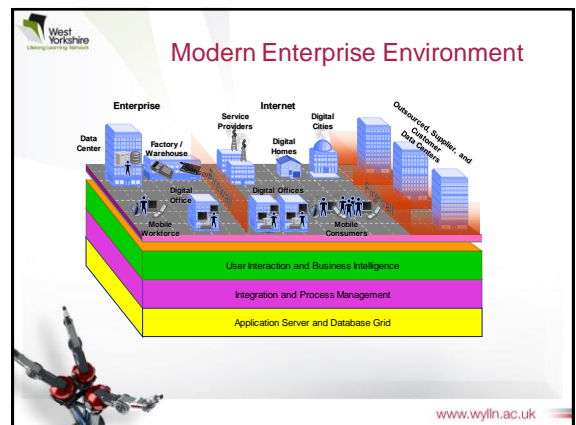
If ...*Collective*... action is not taken, the decline of our prosperity will continue at further pace

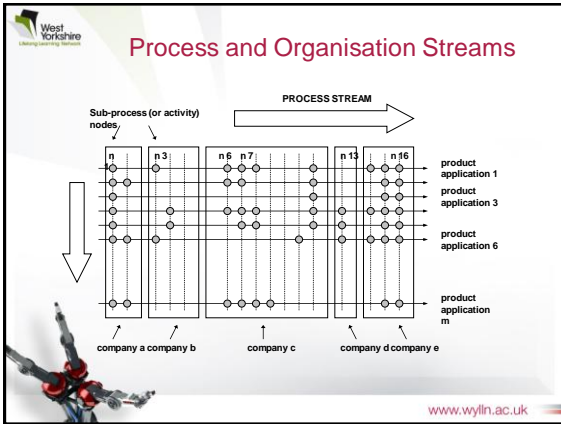
- Reduced Productivity Per Enterprise
- Declining Customer Focus and Profit
- Increased Overseas Activity

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HM TREASURY

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Enterprise Design

- Each case has unique set of market demands and operating challenges but the issues essentially remain the same:
 - Production:** Which product? How many? When ?
 - Inventory:** What is P/M? Stocking points? Levels?
 - Location:** Type of Facilities? Where?
 - Transportation:** How to move? When? Routes?
 - Information:** Collected? Shared? Decision Making?

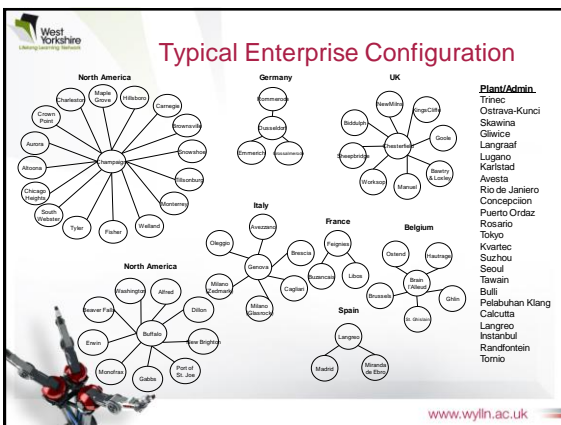
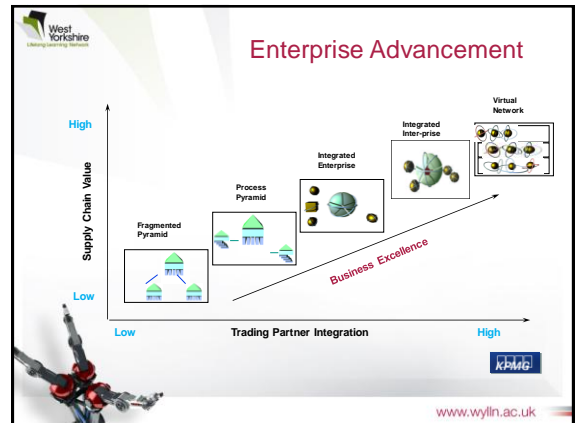
Balancing Quality, Speed and Price !!!

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Achieving Business Excellence

- How to achieve 'World Class Manufacturing'
- Strategic Planning Processes
- People and Team
- Total Quality and Continuous Improvement
- Planning and Control Processes
- New Product Development Processes

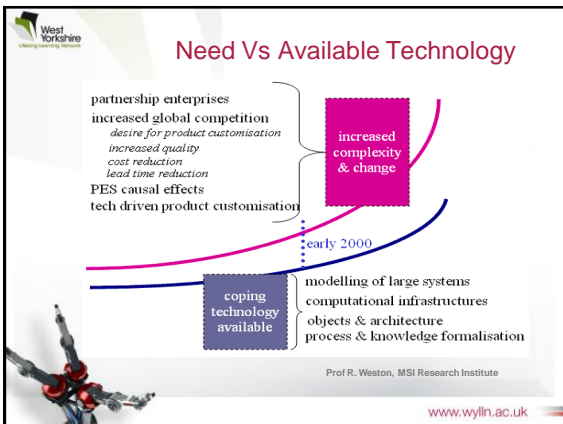
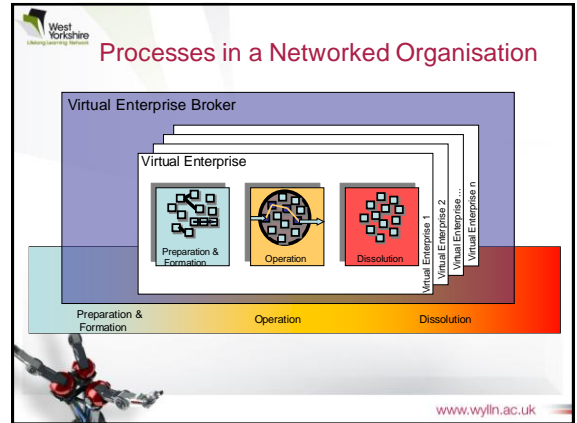
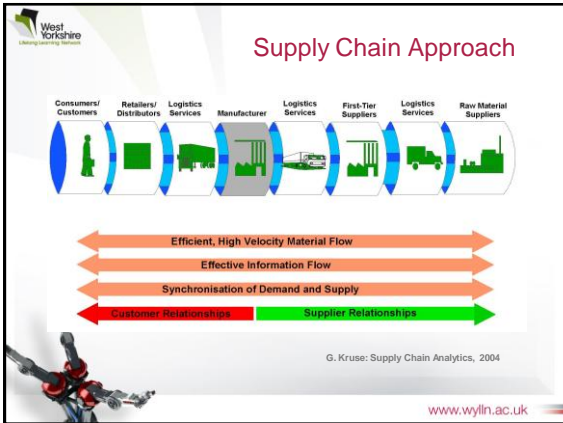
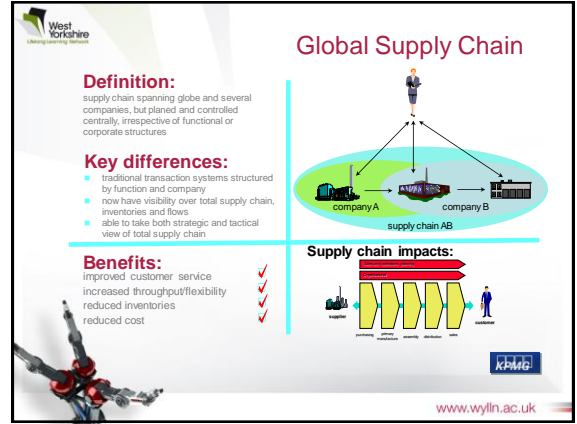
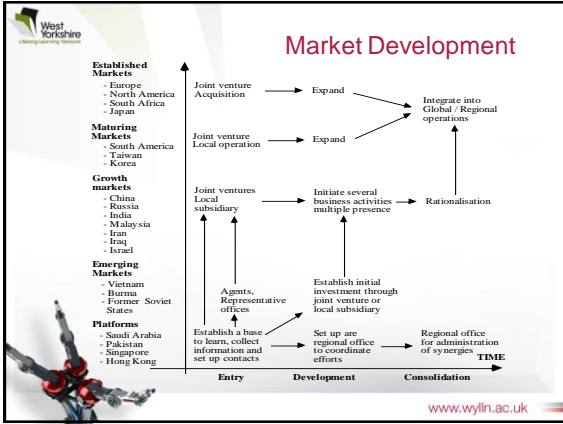
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Mergers, Acquisitions & Divestitures

- Recently, 30% of the World's 2000 leading enterprises were considering acquisition
- 40% Saw themselves as acquisition targets
- In 1999, the value of these transactions was estimated to be more than \$2 Trillion
- Reductions are born from:
 - Lack of differentiation and a high rate of generalist focus
 - Poor return on investment measurements
 - Lack of required skills and ineffective alliances

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Or Like This?

Creating a 'Joined-Up' Supply Chain
We need to examine the information flow in its entirety...

Does info. normally flow this smoothly?

Or is it more like this?

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Three Magic Steps

Step 3: Optimising the Supply Chain

Step 2: Integrating Business Processes

Step 1: Automating Business Processes

But Where is the Products and the Customer Focus???

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Barriers to Success

- Old and inflexible systems
- Human resource commitment
- Financial resource
- Different business cultures
- Reluctance to change
- Lack of Teamwork culture
- Confusion and loyalties
- Disruption to business
- Performance
- Ownership of initiatives
- Personnel management
- Timescales
- Performance measurement
- Low levels of Staff involvement

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Advanced Engineering and Manufacturing

Including Food Manufacturing and Related Industrial Chemistry

The Case for Open Innovation

Alastair McKinna QC
At the Bar afterwards!

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The Knowledge Landscape is Changing

change

No man (or woman) is an island (John Donne)

Good ideas are widely distributed

Enterprises must look beyond their own boundaries

Knowledge-sharing

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Shifting Sand

- In the US the number of patents held by individuals and small businesses in 1970 was 5%...thirty years later it is over 25%
- US businesses employing less than 1000 people had 4.4% of US industrial R&D in 1981...20 years later it was 24.7%!
- Similarly those employing more than 25,000 had 70.6% in 1981...in 2001 this figure is 39.4%
- In short...another cycle!

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The Next Move?



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Innovation

- **Disruptive Innovation** seeks to gain market share through disruptive techniques which, through new technology, take advantage of competitors' weaknesses, for example offering cheaper versions of a homogenous product.
- **Open Innovation** meanwhile has a more symbiotic approach. By looking to outside sources for inspiration and accepting knowledge and information from external partners, organisations can grow together and exploit new technology.

It is the latter approach of open innovation that is felt to provide a more stable foundation for long term business growth and technological advancement.

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One Viewpoint?

Business model central in organising innovation

External knowledge equals Internal knowledge

Rise of intermediaries


Open Innovation
26.9.2009 - v4

Internal R&D needs to be well connected to outside knowledge sources

Proactive role in IP management

Non-objective evaluation: biases can and do exist

External opinion valued, spillovers allowed

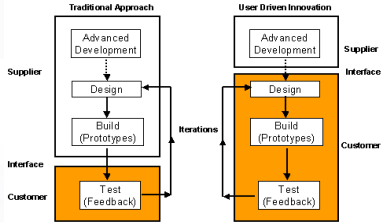


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A Different Approach or Another Fad?

Open Innovation




Source: Thomke S. / von Hippel, E. (2002): Customers as Innovators, Harvard Business Review 80/2002

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Ideas Without Edges?

- An entrepreneurial and global mindset
- Thinking inside-out?
- These are some of the things to consider this evening
- To boldly go where no one has gone before....



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Self Reflection

Perceptions

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How?
What?
Where?
Why?

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Some Open Innovation Fans!

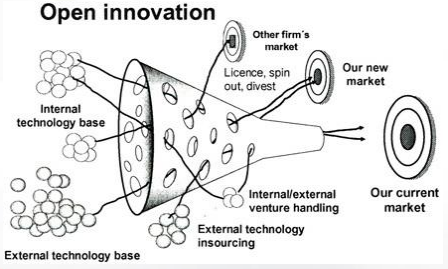


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This is What the Fuss is About...

Open innovation



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Paradigm Shift...

- Enterprises are increasingly rethinking the fundamental ways in which they **generate ideas** and bring them to market..harnessing external ideas while leveraging their in-house R&D outside their current operations
- A **recession**, the likes of which we have never seen before, innovate or die, is even more relevant
- There needs to be paradigm **shift**...if we try to solve tomorrow's problems with today's solutions what will we get?



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Some Open Innovation Thoughts

- Firms **must** look beyond their own boundaries for success
- A new definition of risk...a paradigm shift?
- "**Inside-out**" thinking
- First coined by Henry Chesbrough 1996
- The empire of the future will be an empire of minds (Winston Churchill)
- Collaboration models for SMEs often require intermediaries

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'Sharing Knowledge'

- Open Innovation still makes a lot of people nervous. Large corporations fear being accused of "**stealing ideas**"
- British Design Innovation
- Oakland Innovation
- Kraft/P&G/Netflix/BMW/Airbus are examples of company Open Innovation initiatives



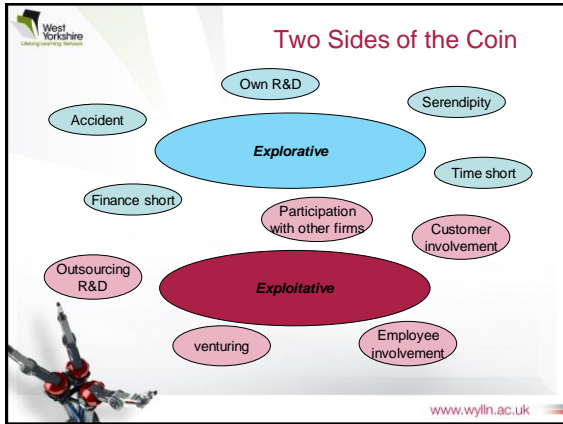
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Application in SMEs

- There has been little focus on SMEs re. OI yet they are often important drivers of innovation
- Advantages in flexibility but disadvantaged in scale
- Difficulties in transforming invention to innovation

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Examples of Alcoa's Open Innovation

- Eco-Friendly Bus** Customer Yutong Bus Co. Challenge Critical weight reduction in the world's largest bus market Summary Alcoa and Yutong Bus Co., China's largest bus manufacturer, are developing an environmentally-friendly bus design to significantly reduce greenhouse...
- Chevrolet Sequel** Customer GM Challenge Extending the range and acceleration of a fuel-cell concept car through mass reduction. Alcoa engineers partnered with GM on structural design, engineering and manufacturing, as well as fabricated more than 300 aluminium structural components and built...

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Barriers to Open Innovation

- Extra administration
- Finance
- Lack of technological knowledge
- Legal/administrative knowledge
- Marketing Insufficient market intelligence, market affinity, marketing problems with new products
- Organisation/culture /shared values
- Intellectual Property issues
- Attitudes to Risk
- Employees lack knowledge/competence, not enough labour flexibility
- Lack of employee commitment, resistance to change
- Idea management
- Different time frames

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An Opportunity or Just Too Much Trouble?

- At the Convergence 2008 conference on automotive electronics, BMW announced that it is looking for partners with which to collaborate on an open-source car computing platform. No other auto companies have officially signed on to collaborate, though Chrysler, Ford, GM, and Honda have reportedly expressed interest.
- BMW's goal, with or without partners, is to have an open-source operating system in a vehicle selling 200,000 or more units over the next five to seven years.

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The "Logic" of Open Innovation

- Good ideas are widely distributed and no-one has a monopoly
- Not all the smart guys and gals work for us
- Companies must have poker players as well as chess players
- The need to manage IP in order to manage research

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Involving Customers in Innovation is not new...

- Proctor & Gamble has been using a programme called **Connect + Develop** – a form of Open Innovation
- Described as accessing externally developed IP developed in others businesses and using the developed assets and know how to be used by others.

In other words let's get together and become business partners and jointly benefit!

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Potential Benefits

- P&G's Connect + Develop Strategy already has resulted in over 1000 active agreements
- 50% of P&G's products have benefited from some kind of external collaboration
- In reality though, is this not an impossible task with small businesses?

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New and Improved Ways...

- Of organising...of leading...of innovating
- Embracing different cultures...different mindsets
- Customers within our organisations are as important as without

What is Happening Already?

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World at Your Finger-Tips

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Internal IT Structures

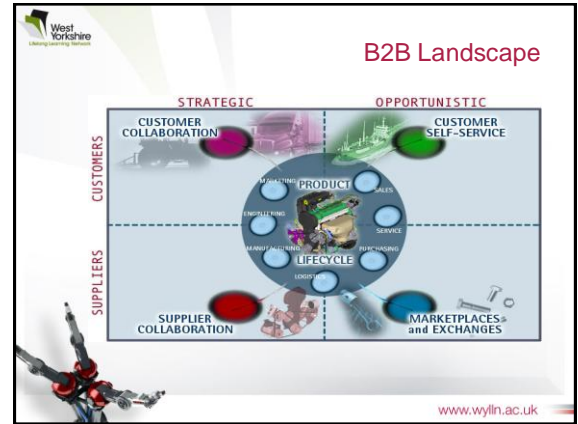
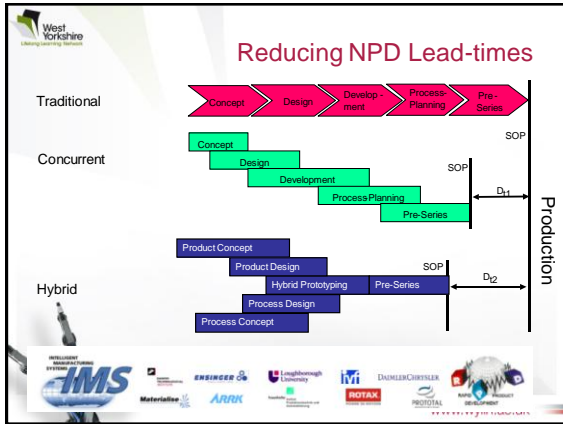
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Internal Focus of Systems

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External Focus is Required

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Winning: E-Collaborative Bidding

Collaborating with other businesses electronically across the internet to jointly bid for contracts

You and your competitors!

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These Have

...to provide their customers with services no airline can deliver on its own

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Why SME Focus

Procurement is skewed against smaller firms:

A more level playing field for (SMEs) can be achieved to replace.....

Win Lose With
Win Win

based on sharing competencies

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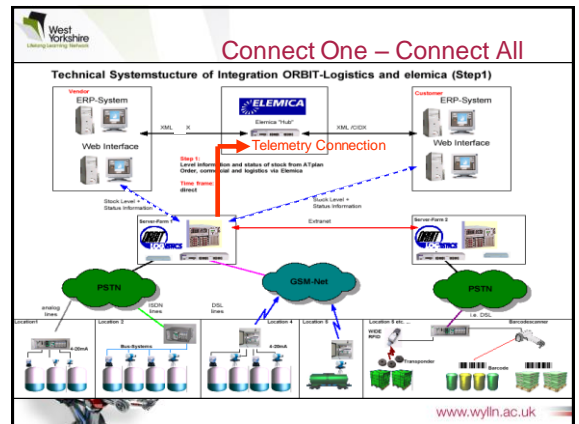
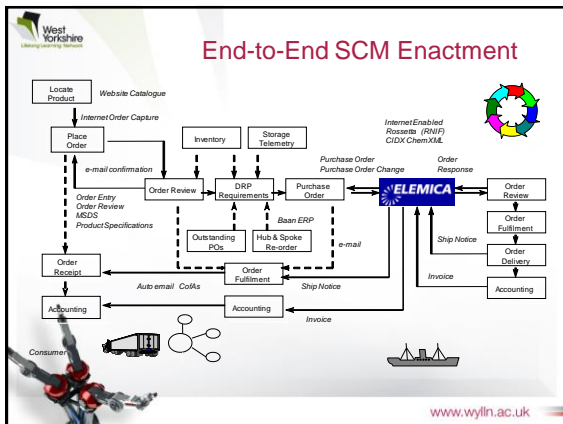
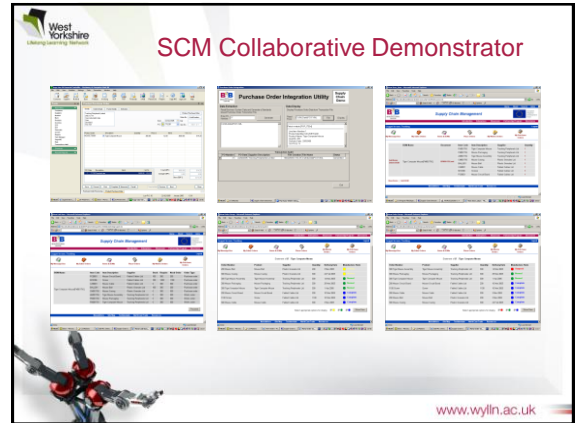
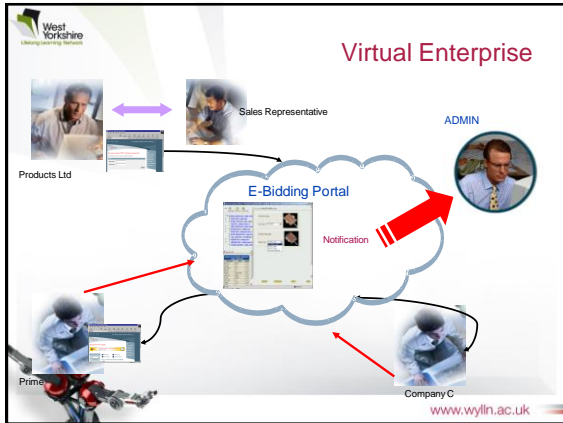
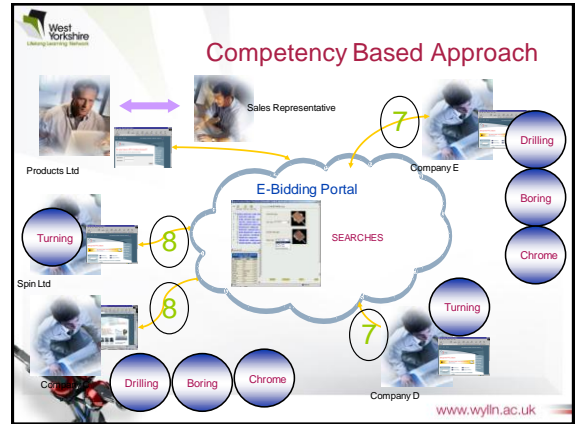
E-Trading Portal


West Midlands Collaborative Commerce Marketplace

Account Login

What's On - Events


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SCM and SMEs

- SCM is not a high priority amongst SMEs (Quayle, 2000)
- SMEs lack time & resources to adopt SCM technology (Wagner et al, 2003)
- SMEs do not recognise the benefits of effective SCM (Stockdale & Standing, 2004)
- SMEs supplier relationships do not encourage innovation (Stockdale & Standing, 2004)
- SMEs have 'arms length' relationships with their suppliers (Morrisey & Pittaway, 2004)
- UK's performers 97% on-time, North top performers 92% (Winning Moves, 2004)



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Recent Research Programme


mazda

Nippon Steel Corporation on the Leading Edge-Nippon Steel




LABTEX


TOYOTA



BOVINCE


SPS TECHNOLOGIES
HERESPACE PARTNERS

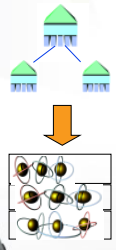

VEHICLES INSIDE NISSAN OUR SERVICES




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Recapping UK Development



- Manufacturing Supply Chain Dominated by Large Hierarchical Corporations
- 99% of UK Businesses are SMEs
- SMEs are Excluded or Low Tier Suppliers



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Risks and Opportunities

- Need to Safeguard Knowledge in Declining Sectors
- Promote 'New' Clusters
(Creative and Digital)
- Focus upon Innovation
- Improve Synergies Between the Two
- Concerns About Service Sector?



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Strategic Problems


- Too Much Emphasis?

Productivity Push

'v'

Innovation

- What to do When Internal Systems Have Become Very Efficient – Offshore?



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Points of Development

- Government Policy on Creativity and Innovation (Cox Review)
- Strong Collaborative Approaches
- Critical Mass of Innovative, Globally Competitive Companies
- World-class, Internationally Renowned Knowledge Communities
- Multi-disciplinary Exploitation



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Innovation Challenges

Inspiration
+
Creativity

SMEs

Design
+
Exploitation

Generation of
New Ideas

Extract Value
from New
Ideas

Open
Innovation

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Problem Areas

- Large Company R&D Department or Project Focus Top-Down
- Innovation Ownership
- Company-wide Approaches
- SME Resource Constraints
- Exploitation Methodology
- Intellectual Property Protection

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Current Developments

- Much Research Ongoing on Open Innovation
- Whilst Technological Need Remains Little Effective Support Exists
- Government Bodies are Currently Providing 1st Phase:
 - Infrastructure and Environments
 - Assisting Start-up Funding and Tax Breaks

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Japanese Approach

- 75% Manufacturing and Export
- Highly Hierarchical
- Driven by established Networks
- Rising Labour and Raw Material Costs
- Scared of Outreach and Foreign Investment
- Extraordinary Attention to Detail
- Few Natural Resources
- Lower Creative 'Sparks'

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Nissan Production Emphasis

Globalization

Geographic dispersion (Russia, India, Morocco, etc.)

Vehicle assembly plant - 26
Powertrain plant - 25

Information sharing through the intranet

Web-type global friendly competition

Globalization

Overview	Aim	Issue	Measures
Global production	Minimize cost	Minimize number of plants	Standardization of factories
Global production	Enter in mature market	Local adaptation	Local production
Global production	Minimize number of plants	Local adaptation	Local production
Global production	Enter government in mature market	Local adaptation	New development
Global production	Enter government in mature market	Local adaptation	Information sharing
Global production	Enter government in mature market	Local adaptation	Local R&D
Global production	Enter government in mature market	Local adaptation	Local R&D

What is IFA?

Smooth material flow & low cost automation

Introduce low cost automation
+ Karakuri = automation with wisdom

Make material flow smooth without stagnation by looking into the flow
= Status with no waste

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Much Less to Say...

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How to Get the Best of All Worlds

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Extra-Disciplinary – Open Innovation

WOIS - Contradictions

QFD - Voice of The Customer

TRIZ – Systematic Innovation

Strategic and Realistic

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Conclusions

- Innovation Exists in All Companies
- Knowledge Capital is Not Always Valued

How do you Get People to Think Innovatively Outside Enterprise Boundaries and Create Value?

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The Trybos Model

To drive successful change and innovation

The level of dissatisfaction with the current situation

A clear and positive vision of the future

Knowledge of the first few steps

The economic and psychological cost

A + B + C > D

Supply Chain Opportunity

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Organisational Futures

Delivering Success:

- What Will Our Future Look Like?
- New Skills Requirements
- ‘Do Nothing’ Option
- Wait Until it is too Late
- Uncertain and Mixed Global Economy
- Rising Labour Costs
- China Overtaken UK as 4th Richest Country
Now – 6th Behind France

Focus Together Upon the Business Case
(Quality, Speed and Price)

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Advanced Engineering and Manufacturing

including Food Manufacturing and Related Industrial Chemistry

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