
Innovation for Growth in SMEs: Exploring Successful Innovation Practice

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Overview

1. Why Innovate and its literature bias
2. Importance of SME's
3. LMT and HT SME differences
4. Irish LMT SMEs cases
5. Exploring SME Innovation (Outcomes, processes & capabilities)
6. Discussion
7. Implications (theoretical and policy level)

Is Every Organisation Innovative?



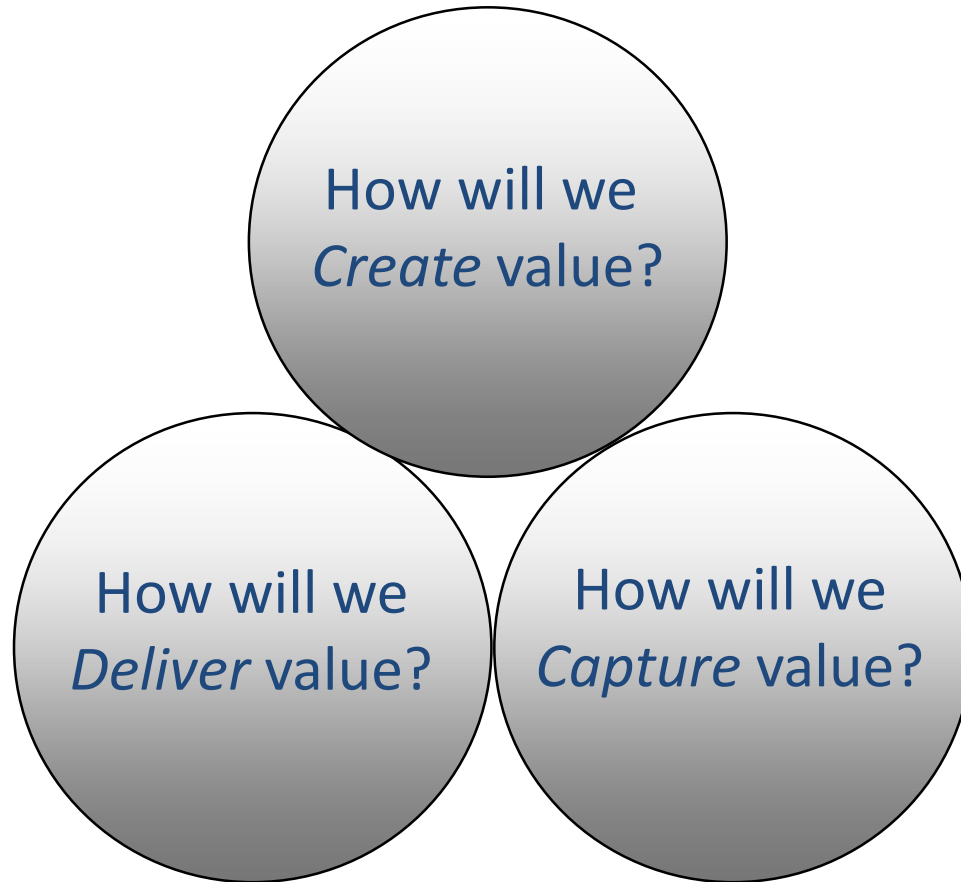
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Yes!
They are or have been in the past.



Effective Innovation: three key questions



Obsession with R&D

Neoclassical growth theory

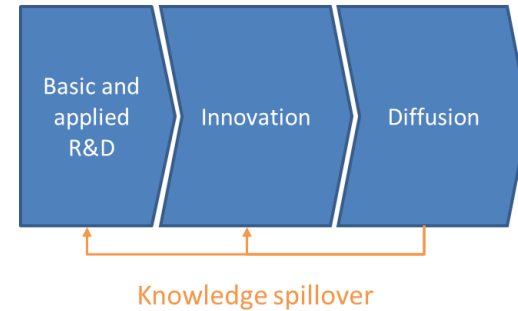


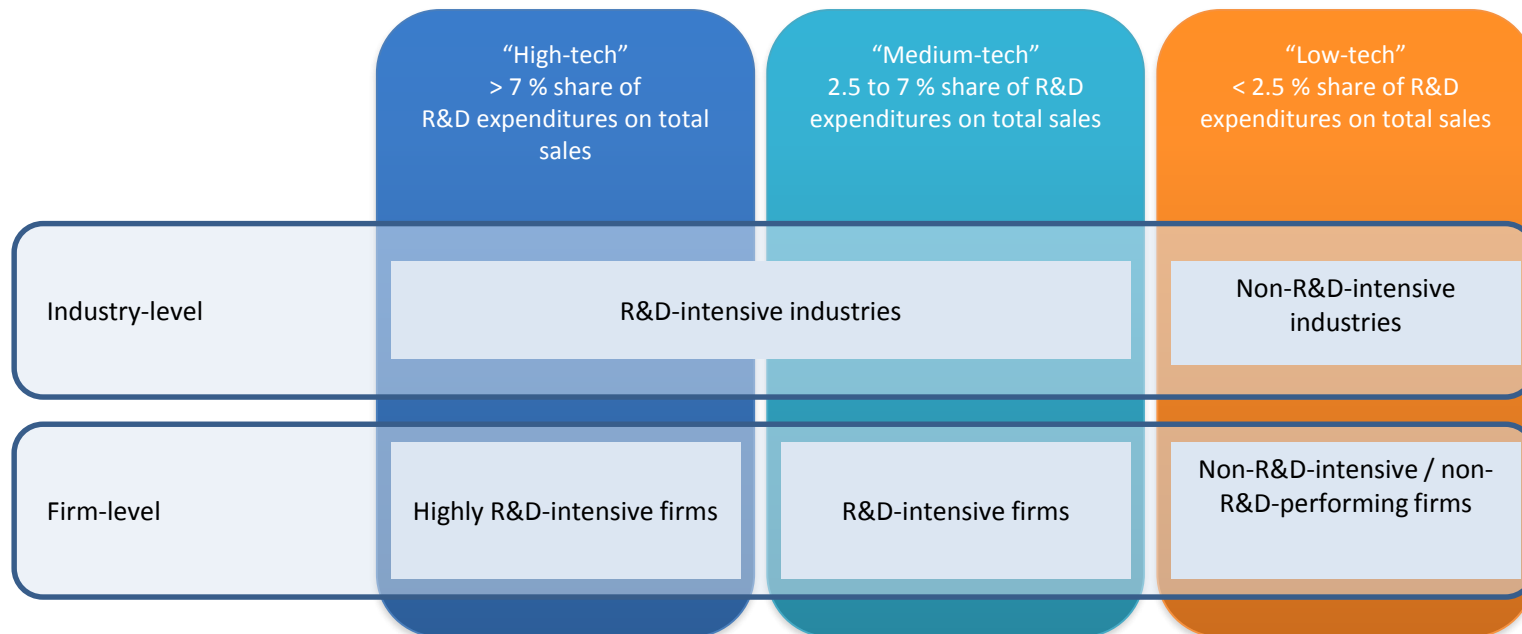
Table 2: Percentage of enterprises engaged in technological innovation expenditure by nationality of ownership, sector and size class, 2016

	Nationality of ownership		Sector of activity		Size class			%
	Irish	Foreign	Industry	Services	Small (10-49)	Medium (50-249)	Large (250+)	
In-house R&D	23.2	29.6	35.4	18.7	20.9	33.9	51.6	24.4
Purchase of external R&D	8.8	11.7	13.2	7.3	7.4	14.1	25.6	9.3
Acquisition of machinery, equipment and software	23.2	25.8	33.1	18.8	21.1	31.6	38.6	23.7
Acquisition of other external knowledge	6.3	6.5	8.2	5.3	5.8	8.4	8.4	6.3
Training for innovation activities	13.2	14.6	16.1	12.1	12.2	17.1	22.5	13.5
Market introduction of innovations	9.1	11.6	10.7	9.0	8.7	12.1	15.4	9.6
Design	12.2	13.5	14.5	11.4	11.6	14.7	20.4	12.5
Active - all other expenditure	7.5	11.3	10.7	7.0	7.1	10.8	19.3	8.2
Total	36.3	43.2	47.8	32.3	33.1	51.2	66.0	37.6

- Today, 95% of all empirical innovation research is focusing on R&D as an explanatory variable (Becheikh et al. 2006; Barge-Gil et al. 2008; Arundel et al. 2008)
- Low and Medium-low technology (LMT) sectors not fitting this model (Arundel et al. 2008; Barge-Gil et al. 2008).
- LMT sectors dominated by SME firms, often based in indigenous firms.
- Highly important to economic well-being and regional employment but has become the 'forgotten sector' (Hirsch-Kreinsen, 2008).

Incomplete understanding of innovation management and especially for SME community

Low and Medium Tech firms (LMT)



Legler and Frietsch (2007)

Low and Medium Tech firms (LMT)

ISIC REV. 3 TECHNOLOGY INTENSITY DEFINITION

Classification of manufacturing industries into categories based on R&D intensities

High-technology industries

- Aircraft and spacecraft
- Pharmaceuticals
- Office, accounting and computing machinery
- Radio, TV and communications equipment
- Medical, precision and optical instruments

Medium-low-technology industries

- Building and repairing of ships and boats
- Rubber and plastics products
- Coke, refined petroleum products and nuclear fuel
- Other non-metallic mineral products
- Basic metals and fabricated metal products

Medium-high-technology industries

- Electrical machinery and apparatus, n.e.c.
- Motor vehicles, trailers and semi-trailers
- Chemicals excluding pharmaceuticals
- Railroad equipment and transport equipment, n.e.c.
- Machinery and equipment, n.e.c.

Low-technology industries

- Manufacturing, n.e.c.; Recycling
- Wood, pulp, paper, paper products, printing and publishing
- Food products, beverages and tobacco
- Textiles, textile products, leather and footwear

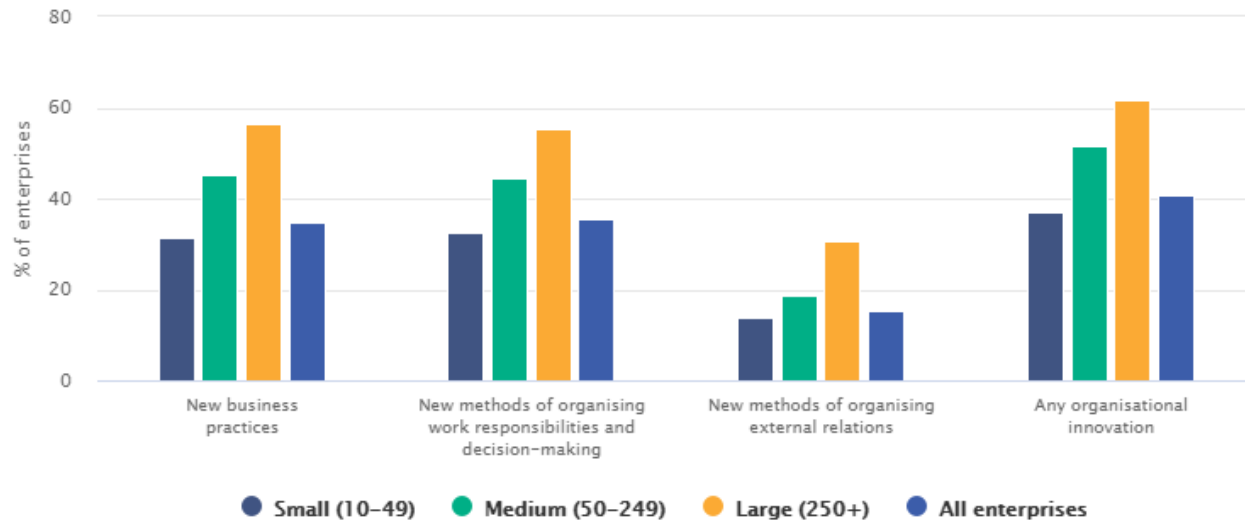
**Sectoral classification based
on BERD from OECD 1997 and
revised 2011 (R3)**

LMT pressing need

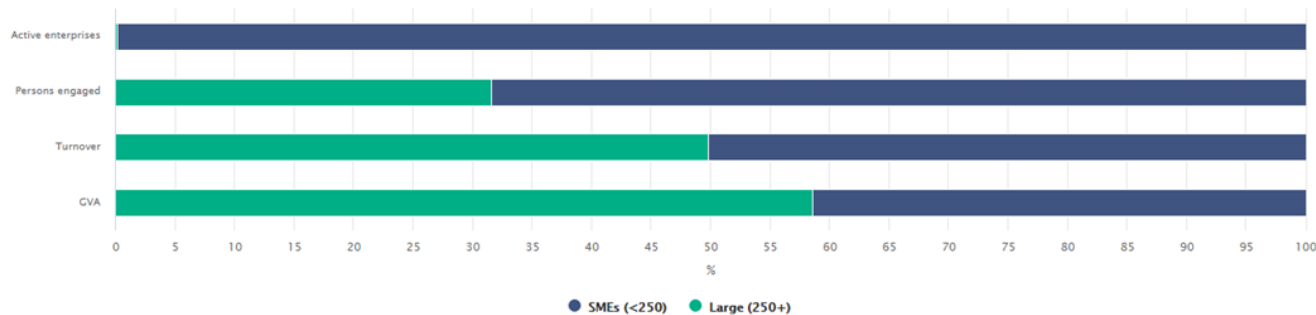
- LMT sectors account for over half of all EU innovating firms (Arundel et al 2008)
- Accounts for 40-60% of industrial value added and more than half of industry-based employees in EU (Hirsch-Krenschen, 2008, Rammer et al, 2011, Som and Kirner, 2015)
- Dominated by SME's, which account for more than 90% of European firms.
- Highly embedded in regional and national supply chains and local markets (Som and Kirner, 2015).
- **Despite limited R&D, such non-R&D active firms have legacy of achieving innovation and sustainability contrary to accepted theoretical best practice and policy trajectories.**

SME's important and innovating

Figure 11: Organisational innovation rates by size class, 2014–2016



Source: CSO Ireland



Source: CSO Ireland

SME challenges

Figure 14: Factors hampering innovation activities by sector, 2014–2016



Source: CSO Ireland



SME's not all the same

- High Tech
 - Relatively young
 - Experienced management team
 - Small but large firm currently small or gone?
 - Adequately financed
 - Singularly focus of technological novelty at heart
 - Higher profit margins
 - Global view
 - Open to exit strategy
- Low and Medium Tech
 - More established
 - Family/regional management team
 - Larger in scale but conservative growth
 - Bootstrap/ debt financed
 - Dyadic perspective of current market and future
 - Tight profit margins
 - Often geographically constrained view
 - Embedded in region/identity

SME and Innovation literature skewed towards high tech firm model



Not the Frascati definition

Need inclusive definition for all

“Innovation is the process by which firms master and get into practice product design and manufacturing that are new to them, whether or not they are new to the universe or even the nation” (Nelson and Rosenberg, 1993: 4)



Research aim

Context

- The forgotten SME sectors of low and medium-low tech firms that represents the sector majority

Questions

- Accepting they innovate to remain sustainable then where does this occur?
- How do achieve innovation (in absence of R&D)?
- What capabilities underpin their innovation efforts?
- What can be done to enhance sector's sustainability and growth?

Method

- Qualitative approach necessary
- Development of relationship with more than 45 growth SME cases across the R&D intensity spectrum to 'get under the hood'
 - Animal feed, meat processing, food, brewing, furniture, steel fabrication, apparel, plastics, agricultural machinery, specialist engineering, medical devices, ICT.

Irish SME case analysis

- *Tidd and Bessant's 4P's model of innovation trajectory:*
 - *Product, Process, Position, Paradigm*
- *Multiple open ended interviews*
 - *Management team*
 - *Chronological intervals*
 - *Research By Wandering About*
 - *Variation even within industry sectors with phenomena of “high-tech firms in low tech industries” .*

SME innovative comparison

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Chemicals excluding pharmaceuticals
Railroad equipment and transport equipment, n.e.c.
Machinery and equipment, n.e.c.

Medium-low-technology industries

Building and repairing of ships and boats
Rubber and plastics products
Coke, refined petroleum products and nuclear fuel
Other non-metallic mineral products
Basic metals and fabricated metal products

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Food products, beverages and tobacco
Textiles, textile products, leather and footwear

Sample LMT case innovations

Firm #1 Animal feed Inc Ireland- NutX

- Supplier for animal feed for regional agricultural base
- 70 employees
- Family & professional mgt.
- Technical process specialist

Product extension and process 'licencing' out



Firm #2 Metal bash Inc Ireland- Alt Steel

- CMO producer of widgets
- 110 employees
- Entrepreneur and prof. mgt.
- Established reputation for quality, reliability and agility

Process innovation driving new product lines and position innovation



Firm #3 Food Inc Ireland- YogX

- Producer of high end dairy products
- 45 employees
- Family owned & managed
- Specialised supplier and strong customer focus

New market position and co-creation through supply chain network



**All financially constrained and markets tending towards commodization
Very limited history of R&D (e.g. technological SOA)**

Innovation differences across spectrum

Innovation trait	LMT	HMT
Management experience	More on-job and insular	More varied and dynamic
Product offering	More toward commodity	More towards novel
Market served	Closer to base	More global orientated
Customer focus	More B2C orientated	More B2B orientated
Innovation Management	More unstructured and informal	More structured and systematic
Innovation order winner	Cost efficiency and responsiveness	Value-adding opportunity
Dominant innovation activity	Process	Product
Innovation frequency: Product	More incremental and sporadic*	More radical and routine
Innovation frequency: Process	Ongoing	Ongoing
Perception of patents, etc	Not really relevant to business	Necessity for growth (Financing cycle)
Innovation culture/ routines	More tacit and champion based	More explicit and systematic
Open Innovation	Limited and necessity driven	More exploratory and purposive

Product innovation

- Customer responsiveness & Design are drivers of NPD
- Struggle for novelty reinforcing cost dimension and lack of clear value added impacting IPR
- Strategies
 - (1) Typically incremental in nature, heavily skewed toward core business (known-known) and specific collaboration necessity driven
 - (2) Process innovation capability spill over (experimentation)
 - (3) End-product producers increasing technological base\ servization of products to avoid 'commodity hell' (higher tech firm in LMT)
- Advantage:
 - Close to customer and creative experimentation
 - Flexibility, design and process knowledge (Team)
 - *Challenge of SKU proliferation and low volume
 - * IP fallacy



Process innovation

- Necessity driven process innovation, spilling over into NPD
- Heavy customisation of plant and purchase of 2nd hand equipment (*Creative adaptation and frugal mindset*)
- Key innovation capability but often under appreciated internally due to long-term evolution (Unknown-known)
- Advantage
 - Tacit knowledge/ on-job learning underpinning problem solving
 - Deep relationships with supplier base (externally sourced R&D)
 - *Slack required for experimentation impeded by day-to-day pressures.



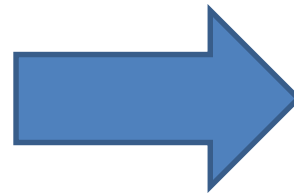
Position innovation

- Geographically constrained due to organic growth
- Limited and primarily vertical or niche in nature
- Either unintentional or last resort to crisis
 - Organic take-over based on increasing success
 - Leverages existing technical and market expertise for problem solving
 - Reinforces project based nature
- Stimuli
 - Entrepreneurial opportunity recognition (Push-Pull)
 - Design and responding to market request
- Advantages
 - Close to emerging market trends
 - Network grounded on trust and proven relations



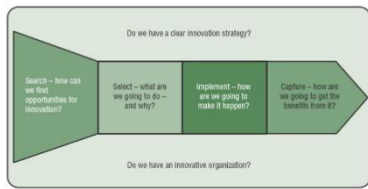
Paradigm innovation

- Prolonged impact of a growing product or positional innovation, unearthing 'true' value added rather than strategic Damascus road- R&D outcome not determinant!
 - Emergent consequence of 'technology shadow options' as opposed to strategic intent to develop new capabilities
 - Success based on experimentation, trial and error\ adaption
 - Reinforces that alternative learning mode to R&D intensive STI mode



Learning by doing
Learning by using
Learning by interaction





How it's managed?

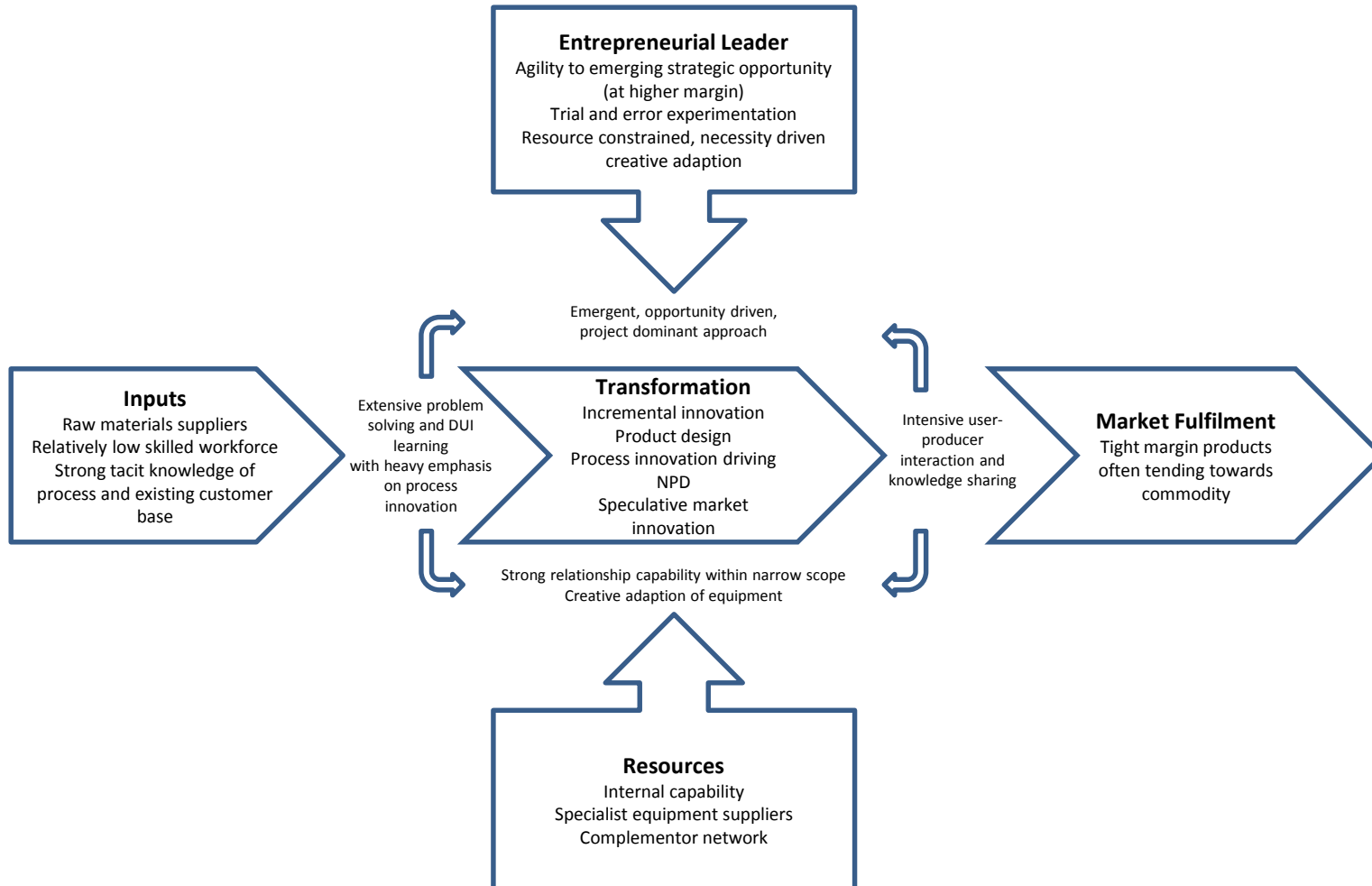


- Unstructured process compared with larger firms and guided by entrepreneurial opportunity recognition rather than defined strategy
- Underpinned by context of constant scarce resources and reciprocal leverage of external sources.
- Individual project rather than portfolio perspective
- Heavily exploitative focused in nature and tendency towards incrementalism
- Reinforces pressing market need at expense of potential future pivots
- Opportunity for increased team decision-making, structured project management routines and diversity of collaborations

Innovation capability

- Entrepreneurial leadership with strong market knowledge
- Deep process knowledge and equipment supplier linkages
- Rich market knowledge and culture of responsiveness\
creative trail and error within resource constrained context
- Enhanced design impacting product and packaging
- Leverage of reciprocity-based collaboration within social network but scope for enhanced breadth and depth
- Predisposition toward DUI learning mode underpins the heterogeneity of its resource configuration and ongoing ability to reconfigure, redirect, transform for innovation purpose

LMT SME Model



Innovation strategies

- Heavily skewed towards emergent entrepreneurial strategy
- Approach of necessity driven collaboration and reiterative trial and error learning centred on the project
 - Move up value chain through technological integration
 - Move up value chain through enhanced design and shifting market
 - Entrepreneurial '*borrowing with pride*' product development
 - Increased efficiency and quality through specialist equipment
 - Responsiveness to market query resulting in internationalisation or analogous industry
 - Entrepreneurial unearthing of 'shadow-options within process equipment that drives product and positional innovation
 - Enhanced absorptive capacity through team training/hiring

Theory implications

- Categorisation:
 - Industry sectors not homogeneous (Knowledge intensive firm) and under-reporting of LMT innovation (Franscati R&D definition)
 - Centrality of the entrepreneur in LMT innovative success
 - Upper echelon theory and entrepreneurship process
 - Opportunity driven strategic development
 - Lack of explorative focus linked to emergent strategy/ sustainability
 - Process innovation management
 - Selection criteria, exaptation and 'driver of NPD and paradigm'
 - OI leveraged for necessity rather than strategic purpose and default is to rely on internal capabilities
 - Learning mode of DUI rather than STI
- UCC – Alternative capability development to R&D dominant perspective

Advancing LMT SME

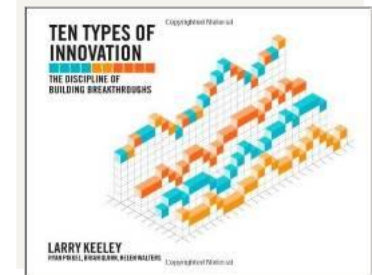
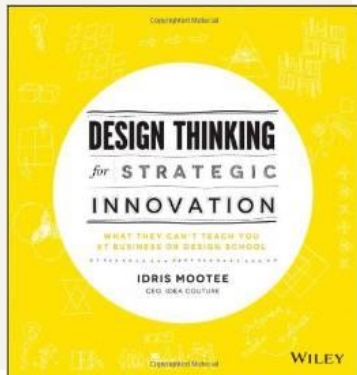
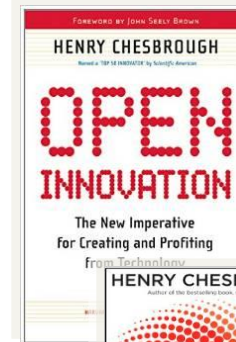
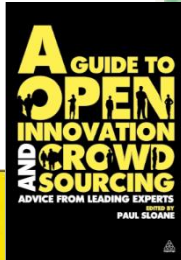
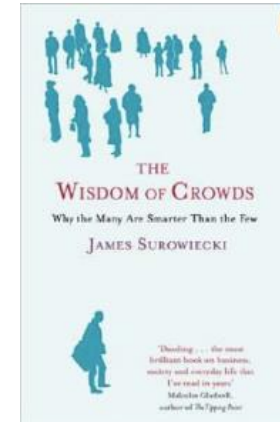
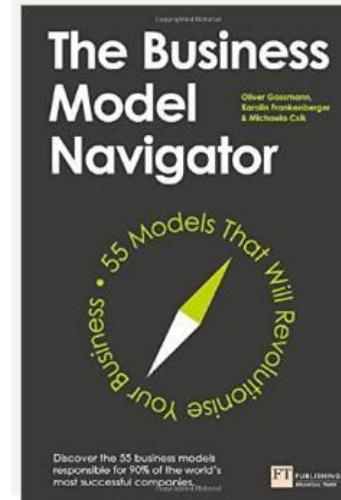
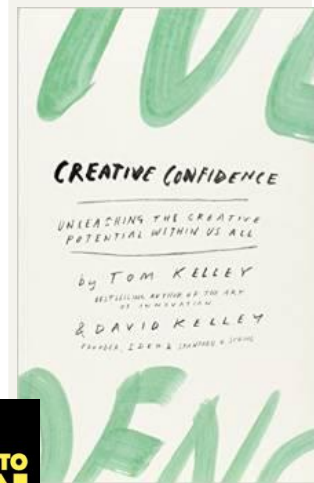
- Innovation under reporting needs increased attention
 - Broader definition of what constitutes as R&D/ innovation expenditure.
- Innovation centrality of entrepreneur/GM within LMT SME
 - Increases importance of management skills development
- Initiatives to enhance process technologies in firm, building out the firm's capabilities.
 - Reinforces sustainability and allows frugal entrepreneurial mind-set discover shadow options
- Initiatives to widen management team's international network
 - Tradeshows & Sales: Opportunity recognition and diversification/ learning
- Initiatives to deepen collaborative capability maturity of the firm
 - Move from transactional to relational and from exploitative to exploratory focus through wider diversity of engagement (depth and breadth)
- Regional support networks (e.g. ProfitNET) to enhance resilience
 - Organic growth rather than systematic structuring
- Role model of MHT rather than HT SME.



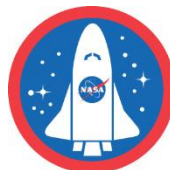
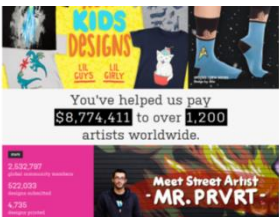
Suggestions and Comments



Useful texts



Management/Organizational



New Knowledge

Open Innovation

Customers



Invention Factories

Lead Users

Empathetic Design

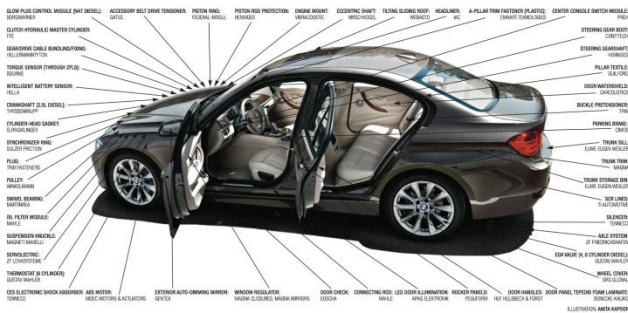


Sony- Battery
 Watson- digital-to-analog converter
 Pixa- Operating system
 Toshiba- Hard Disk Drive
 Texas Instruments- Fire wire

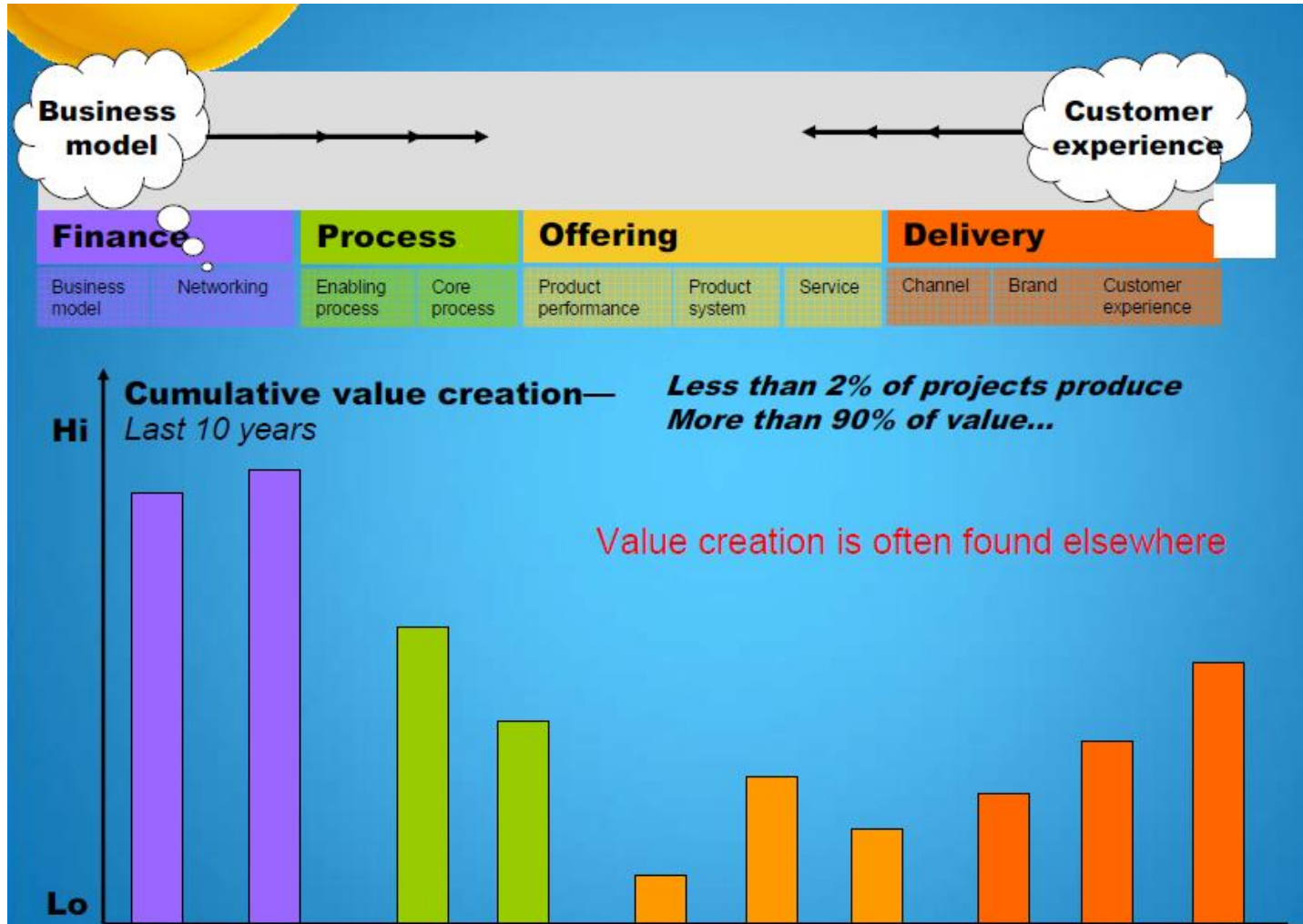


Suppliers to the new BMW 3 series

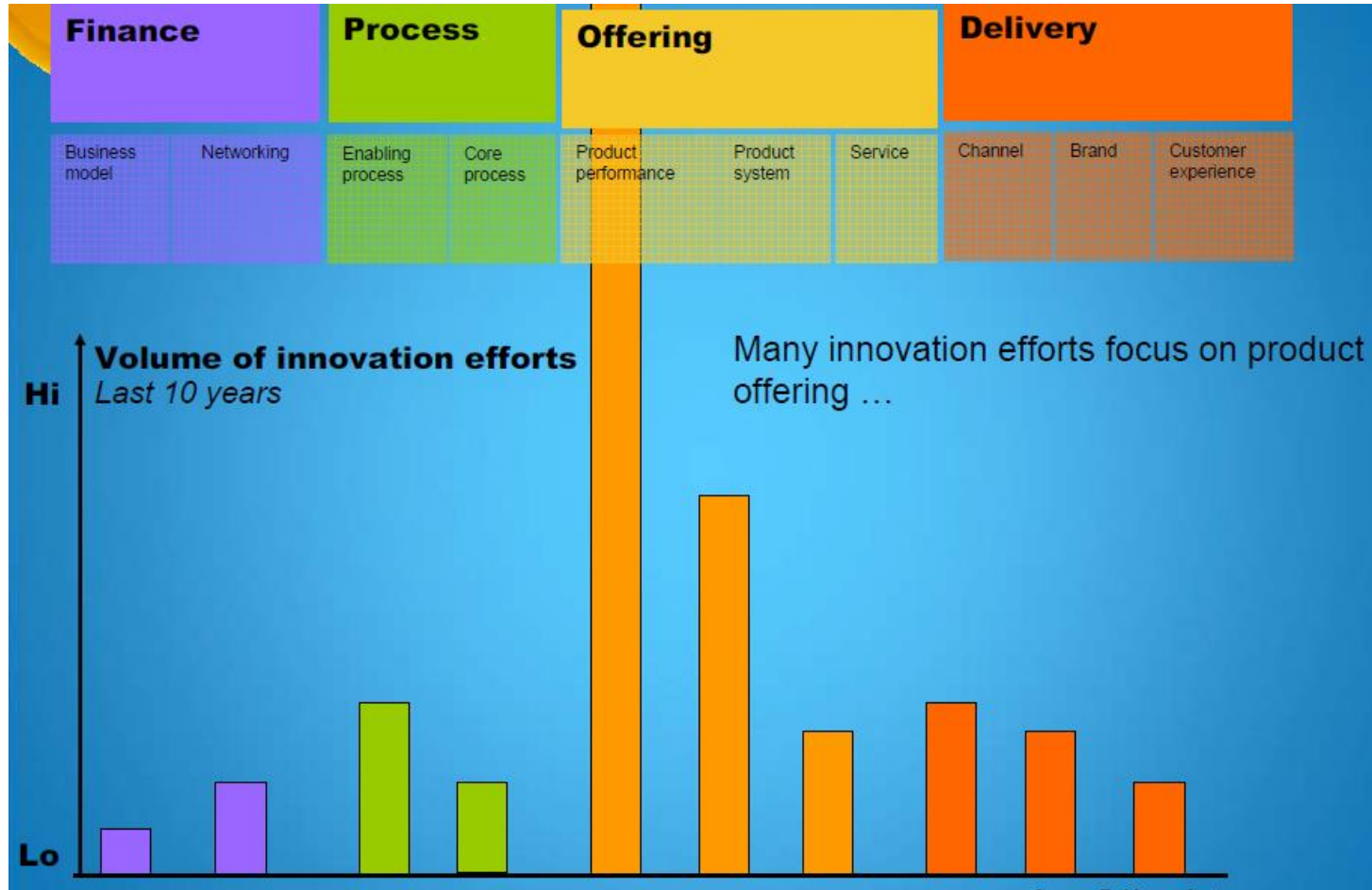
Automotive News Europe



Shifting focus



Dublin ten innovation types



Vanhaverbeke OI model

