Modelling innovation and learning in SMEs

OECD Workshop, June 30 - July 1, 1997
Policy aims

Promotion of innovation, especially in SMEs, for diverse economic and social reasons

Hence

- attempts to identify target groups of firms
- and development of tools and programmes at national, EU, regional, sectoral, private levels
- reviews of previous efforts
- but limited success - why?

Advice to SMEs / Instruments to grow the market for consultancy /
Innovation in SMEs: Difficulties

- Information
- Reluctance to engage outside help
- Financing
- Short timescales
- Risk
- Understanding

- Large firms:
- High tech SMEs:
- Most SMEs:
- Tomorrow as well as today

Innovation in SMEs: Difficulties
Why is it important to understand innovation processes in SMEs?

- Understand the key role of the entrepreneur
- See where and how specific IMTs have their effect
- Identify gaps in provision
- Design new / better IMTs
- Deploy public resources in alignment with policy aims
- Improve advisor / consultant capability
- Target the right firms with the right support
- Achieve ‘best fit’ between tool / advisor / firm
- Understand the key role of the entrepreneur / innovation champion

See where and how specific IMTs have their effect
Innovation is not, primarily, about technology. It is about people, culture, and communication.
An integrated approach
Fields to draw from....

- The business process paradigm
- Product and process innovation research
  - especially in manufacturing
- Learning research
- ‘Routines’ concepts
- Past experience
  - e.g. MINT programme, national schemes
- Case studies to test the model
Innovation in smaller firms

- Doing new things
- Doing things in new ways
- What are we doing it for?
Doing new things

- Identify and scope new market opportunities
- Conceive new products/services
- Design
- Apply R&D
- Prototyping, testing, trial marketing
- Process development
- Product development
- Productionise
- Prototyping, testing, trial marketing

Doing new things
The business process hierarchy (after Harrington, 1991)
Audit based on a process model of technical innovation in manufacturing firms

Core processes:
- Leadership
- Systems and tools
- Resources

Enabling processes:
- Technology acquisition
- Process innovation
- Product development
- Concept generation

Chiesa et al: technical innovation in manufacturing firms
The Chain-linked model of Innovation

(Source: Kline, 1985)
The primary innovation loop

Primary Innovation Loop

Customer feedback

CC = concept generation  PDD = product design & development

Produce/market

Process identification

PDD development

PDD

CC/Market

The primary innovation loop

The primary innovation loop
Innovation in smaller firms

- Doing new things
- Doing things in new ways
- What are we doing it for?
Doing new things: the primary innovation loop

Describes processes of product / process conception,

Enabled by:

– Leadership, direction and climate
– Systems and tools
– Human and financial resources
– Knowledge and technology management (searching for, accessing, screening, internalising knowledge from outside, or identifying/developing it internally)

Doing the same sort of thing - but better, faster, more efficiently

Enables by:

Development and marketing

Describes processes of product / process conception,
The primary innovation loop

CG = concept generation  PDD = product design & development

Leadership & Culture

Systems & Tools

Resources

Knowledge & Technology Management

Customer F/back

Produce/market

Process dev

Primary Innovation Loop
Doing things in new ways: the learning loop

- Changing the rules of the game, to initiate / enhance a learning process
- SMEs are often focused on class 1 routines and need environmental
- Routines must be matched to the changing external
- 3 - Modifiers - allowing other routines to change
- 2 - Augmentation of firm’s capability over time
- 1 - Short term behaviour (operating characteristics)

Routines as the genes of an organisation faster and faster

Need to do more than cycle round the primary loop
A learning process

The primary innovation process can be seen as the action step in a larger loop.

- External position assessment
  - Benchmarking against external comparators, 'best practice', technology impact, business environment

- Internal position assessment
  - Strengths & weaknesses, competences, skills, knowledge
  - Technologies, resources, aspirations
  - Strategic & weaknesses, competences, knowledge

- Financial analysis
  - e.g. business process maps, risk analysis, route mapping

- Quantity and understand
  - Internal position assessment
  - External position assessment
  - Technology impact, business environment
  - Benchmarking against external comparators, 'best practice'
The learning loop
Innovation in smaller firms

- Doing new things
- Doing things in new ways
- What are we doing it for?
Redefining the mission: the strategic loop

- Goals of the firm
- Aspirations of the entrepreneur/owner
- Strategy
- Mission

Then translate goals into clearly understood quantitative objectives.

→ Strategic loop as the initiator for culture change

Redefining the mission: the strategic loop
The three innovation loops

Learning Loop

Strategic Loop

Primary innovation loop

Enablers and supporters

loop

Innovation
What can we do with the model?

- See what’s different about a small firm
- ... but understand priorities
- Help develop a holistic understanding of company needs
- Link innovation climate and the Quality ethos
- Why they inexorably move to a holistic view
- See where programmes such as MINT fit in - and processes
- See where particular IMTs impact on innovation

... but understand priorities
What can we do with the model?
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**Methodology**

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How small firms differ from big ones

Strategic loop: Goals are complex and often dependent on personal aspirations of the entrepreneur.

Need for external help at potentially all stages of the learning loop.

Cycling round the primary loop is discrete, not continuous.

Issues:
- Limited resources / people / money / skills / knowledge / time
- Risk aversion
- Short termism
- Some information channels more accessible/useful than others

Hence, tools must cater for SMEs' specific situations.

Strategic loop: Goals are complex.
What information channels are useful?

- Supply chain sources: customers, suppliers, competitors
- Trade media and exhibitions
- Learning from peers
- IMTs should help firms key into information channels based on supply chains, local networks, industry sectors, etc.

But: are firms learning sufficiently from other sectors?

Less importance attached to consultants, public sector, universities.

Supply chain sources: customers, suppliers,
Risk: a key issue in SME innovation

- Risks greater for smaller firms
  - partly due to limited access to information; finance; management / technology skills
- Stakes are high & consequences severe
  - personal assets at stake
  - only one chance: failure may prejudice survival
  - parties due to limited access to information; finance;

Reducing the risk

- early tangible results give confidence for larger changes
- intelligent friend of the business

Result - high risk aversion

- incremental, not just radical, change
- reducing supply chain pressures

Stakes greater for smaller firms
The four growth strategies:

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Innovation management tools (IMTs)

Types:
- Generic diagnostic, auditing & benchmarking tools
- Tools to address specific themes / technical issues
- Facilitated or D.I.Y.
- Consultant assessment; creativity/visioning; etc
- Graphical visualisation; questionnaires; workshops

Approaches:
- Flexibility is important: don’t stifle the advisor
- Consultant assessment; creativity/visioning; etc
- Graphical visualisation; questionnaires; workshops

Methods:
- Graphical visualisation; questionnaires; workshops
- Consultant assessment; creativity/visioning; etc
- Flexibility is important: don’t stifle the advisor

Use:
- Facilitated or D.I.Y.
- Consultant assessment; creativity/visioning; etc
- Graphical visualisation; questionnaires; workshops

Resources:
- Short intervention: typically 1-5 days advisor time
- Quickly demonstrate value of external advice
- Cheap in time & cost - but MD/CEO commitment vital

Types:
- Generic diagnostic, auditing & benchmarking tools
- Tools to address specific themes / technical issues
- Facilitated or D.I.Y.

Innovation management tools (IMTs)
Diagnostic tools - some cautions

- recognize how information gets to SMEs
- look for 'best fit: advisor / tool / firm
- ensure learning is embedded in the firm
- provide for implementation & follow-up
- recognize how information gets to SMEs

Don’t
- lapse into business school jargon
- try and be all things to all men
- assume large-firm models of best practice fit SMEs
- use a facilitator

Do
- look for 'best fit: advisor / tool / firm
What diagnostic tools can achieve

- Rapid but wide-ranging ‘health check’
- Assessment based on views of the firm’s own staff

- Identify issues for attention / concern
- Highlight and probe areas of disagreement
- Benchmark practices / performance (firms or sectors)
- Encourage dialogue within firm
- Emphasise people, culture and communication

Encourage strategic thinking - with a dual perspective:

Business Strategy

Technology Strategy

- Encourage strategic thinking with a dual perspective:
  - Emphasise people, culture and communication
  - Benchmark practices/performance (firms or sectors)
  - Encourage dialogue within firm
  - Highlight and probe areas of disagreement
  - Identify issues for attention / concern
Then revisit and measure progress

Diagnosis must lead to a plan of action
- Enthusiasm diminished as the diagnosis led inexorably towards action
- Early tangible paybacks build trust and confidence
- Start a process: Diagnosis must lead to a plan of action

The link to action

Long term change
Quick paybacks
Action plan

For long term change
Some selected IMTs

- PROBE (UK/Germany)
- The PERA Profile diagnosis (UK)
- The STIN analysis (Sweden)
- TECHNICAL-DEVELOPMENT (Finland)
- ADVIA (Denmark/Belgium)
- Technology Clinics (Finland)
- TEKES MINT methodology (Finland)
- ANVAR diagnosis (France)
- APRODI training/action (France)
- Value analysis for technological diagnosis (IAT) (Spain)
- BUNT/FRAM (Norway/Austria)
- VISAO (Portugal)
- Product / Market / Technology Scans (Netherlands)
- The STIN analysis for technological innovation (Italy)
- Quality management audit by Innovare (Ireland)
- Forbairt diagnosis (Ireland)
- Process consultancy (Iceland)
- STRATEGIC, QUALITY AND BUSINESS (Iceland)
- EOMEX diagnosis (Greece)
- Innovation Factor Analysis (Germany)
- APRODI training/action (France)
- ANVAR diagnosis (France)
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Some families of IMTs

- Networking - 'clubs', FRAM
- Tool-kits - BUNT
- Customer focus - Making It Pay
- Method
- Guidelines for consultant assessment - Forbairt MINT
- Product/Market/Technology Scan
- Workshop-based - Innovation Factor Analysis,
- Profile Business Excellence models
- Questionnaire based - Probe/Microscope, Pera
- Graphical visualisation - STIN
The EQA Business Excellence Model

Leadership 10%

People management 9%

Policy & strategy 8%

Resources 9%

Processes 14%

Customer satisfaction 20%

People satisfaction 9%

Impact on society 6%

Business results 15%

Results 50%  Enablers 50%
Good practice - tool design

- Founded on an open, objective model
- Simplicity and clarity in presentation & data collection
- Best fit to company situation, with clear objectives
- Compares with best practice in & beyond industry sector
- Flexible - complements, doesn’t stifle creativity
- Balances comprehensiveness + expectation beforehand
- Collects basic information / time perspective, via PC tool
- Includes action planning step
- Includes cross-section of firm’s success criteria
- Includes discrepancy information
- Consults cross-section of firm
- Facilitates learning by firm
- Linkages to other tools / steps
- Provides for mandatory follow-up

- Consults on an open, objective model
The added value of the advisor

- CEO / staff take assignment seriously
- Forces issues into the open: no place to hide
- Promoting dialogue and wide staff involvement
- Interpreting findings in relation to best practice
- **Action planning and implementation**
- Co-opt and orchestrate other support
- Follow-up
- ‘The business doctor’
Good practice: advisor characteristics

- The consultant as business doctor
- Foundation - trust & mutual respect
- Sustained contact and follow-up
- Tenacity - lead firm to action; signpost to further support
- Comprehensive tool-kit
- Access to networks of support / capability
- Gets CEO commitment - imperative
- Interactive analysis with a representative team
- Supplement by own observation
- Firm’s own assessment, not just the advisor’s view
- Comprehensiveness tool-kit
- Sector knowledge + consultancy skills + training
- ‘The consultant as business doctor’
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- Sector knowledge + consultancy skills + training
- Foundation - trust & mutual respect
The state of the tool-kit: diagnostic tools

- Good on strategy, process & product development
- Less good on human resources & organisation
- Stronger on analysis than planning & action
- Little provision for microenterprises
- Wide employee participation brings big gains
- Advisory / facilitator adds much value
- Discrepancy information invaluable
- Advisor / facilitator adds much value
- Selection and use by advisors
- Common good practice principles for tool design and development
- Advisor / facilitator adds much value
- Discrepancy information invaluable
- Wide employee participation brings big gains
- Little provision for microenterprises
- Stronger on analysis than planning & action
- Less good on human resources & organisation
- Good on strategy, process & product development
The state of the tool-kit: deficiencies of existing tools

- Diagnostic tools too general - need tailoring to specific company types / needs
- Jargon and inappropriate wording for small firms
- Other tools over-concentrate on aspects of primary loop

- Major weaknesses - implementation & follow-up
- Short term involvement: lack of sustained contact with client firms
- Based on big-firm models
- Major weaknesses - implementation & follow-up
- Short term involvement: lack of sustained contact with client firms
- Based on big-firm models
EIMS study:  

Segmentation

- New technology based SMEs
- Niche market differentiators
- Technological leaders
- Joint developers
- Efficient classical subcontractors
- Resilient SMEs
- Would-be reactive SMEs
- Barely surviving SMEs

Pavitt, Chiesa et al:

Science based - technology acquisition
Scale intensive - process innovation
Information intensive - product development
Specialised supplier - product development
Towards new generation tools

Firm characteristics

Consultant observation

Innovation processes in SMEs

Basic tool

Versions - country, sector, firm type

Assess

Signpost

Segment

Monitor/Review

Firm characteristics

Towards new generation tools
Some directions for the future

- Understand how innovation processes in SMEs differ from those in large firms. Then:
  - Modify / redesign tools for SMEs
  - Make them accessible / affordable
  - Facilitate self-help methods
  - Code
  - Informal mentoring
  - Work with groups of firms
  - Promote longer term involvement
  - Fill gaps in coverage

- Link diagnosis and learning to action planning, implementation and follow-up
Some directions for the future (2)

- Better segmentation of SMEs according to type and needs
- Link firms into the most appropriate information channels
- Promote networks, especially for small firms
- Focus on risk reduction
- Incremental as well as radical innovation
- Stronger role for RTOs
- Better networking among consultants / advisors
Case studies
The risk reducer: Paraid

- How to predict, anticipate and overcome bottlenecks?
- Desire for steady growth but limited capital
- Old premises, limited space, disadvantaged area
- MD ex-finance director of parent firm
- paraplegic aids
- Small engineering firm, Birmingham, originally making paraplegic aids

Paraid
The risk reducer: Paraid

Mentoring by design engineer

undertake new product development work

Extra jobs allowed manufacturing director to

- Mix of licensed & in-house products
  - Gradual market shift responding to regulatory changes

Strong product strategy

Strategic review of firm - 'sounding board' for MD

Support - subject to financial and jobs targets

Consultant help to plan expansion and secure grant

Business Link support for consultancy on batch


The risk reducer: Paraid’s success factors

- Organisational and technological change
  - External consultant well chosen & well used
  - Won trust by quick tangible results
  - Broad background -> strategic view
  - Sustained informal contact
- Balanced new product strategy
  - Clear market focus
  - Product licensing for UK / European markets
  - In-house products complement licensed products
- Mentoring
  - Grant support tied to clear objectives
  - Culture change: ISO9000; role of business plan
- Mentoring
  - Culture change: ISO9000; role of business plan

The risk reducer: Paraid’s success factors
The network: Veeder-Root

Manufacturer / supplier of tank gauges, now owned by Danaher Corp., USA

2 problems following acquisition

- Overstocking due to poor stock control and long freight times
- Quality system
- Health & Safety Inspectorate approval - urgent need for
- 2 problems following acquisition

830 staff

Site at Market Harborough, UK - Operations Director

by Danaher Corp., USA

Manufacturer / Supplier of tank gauges, now owned
weeks to 2 days; stock 8 WIP 61.3m to 30.36m.

- T/O +44%, process times -40%, delivery times 8
- Stream of process improvements; product changes
- Cellular manufacturing; kaizen -> Culture change
- IT and air freight to reduce stocks
- Use of Japanese quality experts /US tour/

Stock problem stimulated wider review

Leading to fast track to ISO9000

Training at research & technology organisation

The networker: Veeder-Root
Veeder-Root: success factors

- Top level commitment and example
- Use of parent company and external expertise
- Continuous Improvement (CIRA) and quality clubs
- Top level commitment and example
- Many small improvements = major performance gain
- Harvesting ideas
- Asking questions, talking to people outside the firm
- Personal flexibility
- Competition entries as stimulus
- Suggestions welcomed, acted upon, funded
- Involvement of all staff including juniors

Veeder-Root: success factors