Science 2 Society

Blueprints - SME-University knowledge transfer

University – Industry Interaction Mechanisms 2.0

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Improving 1-to-1 knowledge transfer between Universities and SMEs

PROJECT TEAM – SME-UNIVERSITY KNOWLEDGE TRANSFER

IfM-ECS

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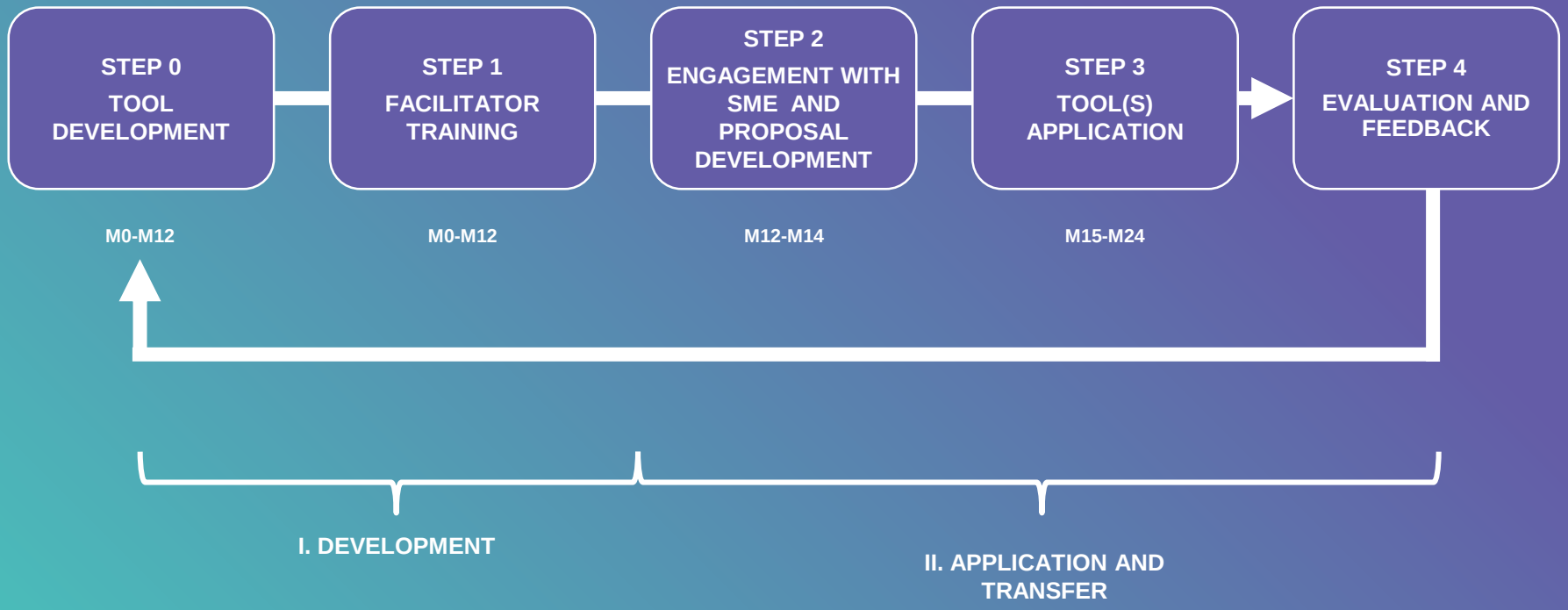
University Knowledge Transfer

(Definition)

*SMEs play a very important role in the EU economy. Boosting **direct knowledge transfer** from **universities to SMEs** can improve an SME's business excellence and substantially contribute to EU competitiveness. SMEs have particular requirements from any intervention. The methods used need to be **resource-** and **time-efficient** and SMEs usually need to see a direct financial return on any investment. If these criteria are met, this classical open innovation approach can be successfully applied.*

*This pilot seeks to understand the **relevant factors influencing the direct knowledge transfer process** (e.g. simplicity of methods, time efficiency of process, trust in facilitator) and find ways to refine them.*

Process overview



STEP 0

Tool development

- Academics conduct extensive research and generate knowledge in terms of publications, case studies etc.
- RTOs work together with academics to codify this knowledge in the most appropriate form (tool) e.g. questionnaires, management frameworks, charts, workshop processes, training courses etc.
- RTOs work together with academics to pilot this tool to several SMEs (3-5) to test and refine it [1].
- RTOs and academics validate the applicability of the tool in multiple sectors and types of companies (with additional 3-5 pilot applications).
- **Decision:** RTOs and academics agree for the readiness of the tool to be applied wider.
- RTOs draft training material for facilitators and supporting documentation to enable the wider application of the tool.

MAIN ACTORS

- University
- RTO
- SMEs

ENABLING ELEMENTS

- Clear problem statement
- Academic theory
- Charts
- Learning outcomes
- Case studies etc.

TIMEFRAME

6-12 months

[1] K.W. Platts (1992). A process approach to researching manufacturing strategy. Research paper

STEP 0

Example of new research co-developed and converted into a tool

Developing scoring criteria for prioritising innovation projects

Opportunity criteria
Can we make more money?
Can we sell it?
Synergies across business
Size of market
Market growth potential
Market profitability (margins in the market)
Competitive intensity in the market
Opportunity to enter new market
Industry maturity / readiness
Exclusivity
Clear customer need
Platform for growth
Future synergies with other operations
Sustainability of competitive advantage
IP – can we protect / exploit it?
Cost reduction
Cannibalise existing business
Business simplification
Learning
NPV>0 or other mutually exclusive alternative
Where the company can offer a differentiated product

Opportunity criteria
Synergies across business
Size of market (available to us)
Market growth potential
Market profitability (margins in the market)
Competitive intensity in the market
Opportunity to enter new market
Industry maturity / readiness
Learning
Clear customer need
Platform for growth
Future synergies with other operations
Business simplification
Cost reduction
Cannibalise existing business
Additional contribution to the same customer
Adding value to service offering

Opportunity criteria		
DIMENSION	FACTOR	DEFINITION
VOLUME	Market size	Size of potential market, or number of potential adoptions, reasonably available to us.
	Our sales potential in a given time	Sales volume or number of adoptions anticipated in a defined time (say, 5 years)
	Synergy opportunities	Possible additional benefits to other projects or activities; or the possibility of new opportunities in combination.
	Customer benefit	Identifiable benefit to customers (internal or external) or potential adopters
	Competitive intensity in Market	Number or significance of the competition
MARGIN	Margin, or benefit per unit	Improvement in product margin (e.g. by cost reduction or price premium) compared to existing products; or benefit to us per adoption
	Business cost reduction or simplification	Facilitates cost reduction or simplification of business processes
	Industry/market readiness	How easy will it be for customers or adopters to take up the product; do they have to change their behaviour or processes?
PLATFORM FOR FUTURE BENEFIT	Market growth	Anticipated growth rate of market
	Future Potential	Product is a platform for future products or could open new markets in future
INTANGIBLES	Learning potential	Will improve the knowledge or competence of the business
	Impact on Brand Image	Effect on B rand image or staff morale
	Impact on key customer relations	Importance for relations with key customers

9 companies - 215 data points → **8 companies - 224 data points** → **27 companies - 433 data points**

Reference: Mitchell et al, 2014

STEP 0

Tool development

CHALLENGES & TIPS

Insights

Tool development is an iterative process that:

- Requires both the researcher and the practitioner to work together over a period of time;
- Requires a minimum of 5-10 company pilots to test a tool's stability and effectiveness;
- It needs to demonstrate a clear logic about the inputs required and the outputs delivered; When a tool contains a series of different steps or is composed of different, independently developed tools this becomes critical;
- Often requires changes to the tool structure or delivery process to make it useful and effective.

STEP 1

Facilitator training

- Facilitators attend an in-house course led by the academic and/or the lead practitioner from the RTO who co-developed the tool with the academic.
- The course highlights the key research and theory behind the tool and the steps to be followed when applying the tool.
- A facilitator supports the lead practitioner into real company engagements (minimum 2 engagements where the lead practitioner leads and the facilitator supports).
- The facilitator leads a real company engagement (minimum 1 engagement where the facilitator leads and the RTO lead practitioner supports).
- **Decision:** The RTO lead practitioner agrees if the facilitator is ready to lead new engagements or additional practical experience is required.
- Regular in-house courses are established for all trained facilitators to update their knowledge with new practices and theory.

MAIN ACTORS

- University
- RTO

ENABLING ELEMENTS

- Facilitators‘ guide including theory
- Sequence of application steps with notes
- Case studies, examples etc.

TIMEFRAME

6-12 months

[1] K.W. Platts (1992). A process approach to researching manufacturing strategy. Research paper

STEP 1

Facilitator training

CHALLENGES & TIPS

Insights

Facilitator training is a continuous process that aims to:

- Enhance a facilitator's knowledge of the key aspects of the background research, engagement method and tool application.
- Ensure facilitator's neutrality and objectivity by reducing or removing any bias and assure SME that any action plan relates directly to the company's most important needs.
- Ensure that a facilitator follows a clear Quality Assurance process that maintains the integrity of the research and enhances the SME's experience and engagement in the process.

STEP 2

Engagement with SME and proposal development

- Start conversations with an SMEs management team.
- Understand the issue(s) an SME may be facing and discuss an appropriate engagement process and suitable tools.
- Draft a proposal for the engagement.
- **Decision**: Proposal is accepted by both organisations.

MAIN ACTORS

- RTO
- SMEs

ENABLING ELEMENTS

- NDA (if applicable)
- Proposal including scope of work and timeline

TIMEFRAME

2 months

STEP 3

Tool(s) application

The tool application and the sequence of applying different tools depends on the particular issue(s) the SME is facing. Some of the most commonly used tools have been the following:

- **Business diagnostic** – assessing the company's performance, prioritising the most important issues and delivering an action plan.

- **Business strategy** – understanding the company's ambitions, competitive position and core capabilities, different operating options and develop and action plan for achieving an agreed "chosen future".

- **Innovation for SMEs**– generating and prioritising innovation options and associated projects plans for growth.

MAIN ACTORS

- RTO
- SMEs

ENABLING ELEMENTS

- Specific tools

TIMEFRAME

10 months

STEP 3

Company examples of tool(s) application

FOOD MANUFACTURER

PROBLEM

On-time delivery performance typically 50%

STEPS TAKEN

- Analyse pattern of demand for each product
- Create production schedules to match this demand
- Introduce ongoing reviews of sales forecasts

RESULTS

- 99.5% on time delivery
- Reduced overtime costs
- Dramatically reduced stress levels

SHEET METAL BUSINESS

PROBLEM

Lack of coordination between sales and shop floor on due dates and priorities for work-in-progress

STEPS TAKEN

- Created a schedule showing plan and progress of all jobs
- Schedule available to office and shop floor
- Orders received are loaded into schedule

RESULTS

- On-time delivery improved significantly
- Newly-arrived urgent jobs completed more reliably

HOSPITALITY BUSINESS

PROBLEM

Company just breaking even – needed to grow but unsure how to do this

STEPS TAKEN

- Strategy workshops identified different customer groups with varying needs
- Range of product solutions created to suit each customer group with appropriate price and service levels
- Internal processes restructured to channel most effort into premium customer

RESULTS

- Revenue doubled in one year
- New staff taken on
- Profits increased

CONSTRUCTION MATERIALS COMPANY

PROBLEM

Company operating in declining industry, forcing closure of one of its production plants

STEPS TAKEN

- Assessment undertaken of the company's skills, facilities and technical abilities
- Strategy workshops identified potential new markets
- New market chosen and appropriate product development using existing skills and facilities

RESULTS

- New product launched
- Land acquired for new facilities
- Staff numbers expected to grow

STEP 4

Evaluation and feedback

- Normally feedback is collected from the SME immediately after the engagement.
- The feedback is typically in the form of a questionnaire that contains questions around the pre-engagement activities, the value to the participant and the organisation, the delivery process and the logistics.
- Occasionally, feedback from the SME is asked after a period of time (12+ months), where actual business results (revenues, number of employees, innovations etc.) are collected.

MAIN ACTORS

- University
- RTO
- SMEs

ENABLING ELEMENTS

- Questionnaires

TIMEFRAME

12-36 months

CHALLENGES & TIPS

Insights

- RTOs employing facilitators who combine both academic credentials and understand the research methodologies and industrial experience.
- Developing time-efficient engagement processes.
- Creating user-friendly tools with minimum academic jargon to facilitate the knowledge transfer.

Learning points

- **Most important findings**
  - Providing all participants the opportunity to express their views in a neutral environment.
  - Having facilitators who have industry experience and can relate to real business issues. They also have the ability to offer several examples to clarify concepts and provide insights.
  - Having an engagement process that is time efficient, has a clear logic between data input, data output and decisions and requires minimum pre-work from the participants.
  - Minimisation/elimination of academic jargon and terminology.

- **Most important recommendations**
  - Communication with the SME in explaining upfront what is required in terms of data and time and examples of potential outputs.
  - Emphasis needs to be placed on the tool design, and ease of use, without expecting users to follow complicated instructions.
  - Manage the company's expectation on time required to achieve tangible outcomes after the process is completed.
  - Allow reflection time in order to gain insights.

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Further details - Example of new research integrated into an existing tool (step 0)

Indirect External Forces IDENTIFIED BY AN SME – BEFORE INTEGRATION OF NEW RESEARCH

	1 Year	2-4 Years	> 4 Years
Social			
Technological			
Economic			
Ethical	THREAT: Behaviour of supermarkets- Retail ethics		
Political			
Legal			
Environ-mental		OPPORTUNITY: Falling oil prices dropping through to energy prices	

Indirect External Forces IDENTIFIED BY AN SME – AFTER INTEGRATION OF NEW RESEARCH

	1 Year	2-4 Years	> 4 Years
Social	THREAT: Disaffected youth leaves skill gap	THREAT: Regular wage rises	
Technological		OPPORTUNITY OR THREAT: Development of new machinery	OPPORTUNITY: Automation Lowers labour dependency
Economic		OPPORTUNITY OR THREAT: • Retail Polarisation • Exchange rate changes	THREAT: Return of Eastern European workers
Ethical	THREAT: Behaviour of supermarkets- Retail ethics		
Political	THREAT: Absence related to family responsibility legislation	OPPORTUNITY: Leaving the EU would present an opportunity for onion and root suppliers	
Legal		THREAT: Removal of pesticides	
Environ-mental		OPPORTUNITY: Falling oil prices dropping through to energy prices	

Further details - Example of new research integrated into an existing tool (step 0)

Policy & Government
- Regulation /Legislation
- Public Sector Spending
- Pro-Manufacturing Policy
- European Union (EU)
- Taxes
- 'Green' Policies
- Political Elections
- Unemployment
- Health & Safety

Society
- Ageing Population
- Population Growth
- Health & Obesity
- Social Media
- Diversity Intolerance
- Disaffected Youth
- Consumerism
- Materialism

Disruptive Technologies
- Bio-technology
- Additive Manufacturing
- Open-source IP
- Cloud Computing
- Automation
- Internet of Things
- Big Data
- Machine Learning (AI)
- Electric Vehicles

Natural Environment
- Sustainability
- Pollution
- Carbon
- ISO 14001
- Climate Change
- Circular Economy
- Land-use Conflict
- Natural Disasters

Labour Resources
- Skills Gap
- Minimum Wage
- Retirement / Pensions
- Apprenticeships
- Foreign labour
- Maternity/Paternity

Non-Labour Resources
- Energy / Electricity
- Oil prices
- Materials / Commodities
- Waste
- Water
- Recycling
- Disposal

Global Issues
- Trade Blocs
- Viruses or Diseases
- Rise of BRICS
- Land 'grabs'
- War / Terrorism

Economy
- Recession / Recovery
- Exchange Rates
- Interest Rates
- Access to Capital
- £ vs €

Market Forces
- Competitors
- Suppliers
- Customers
- Collaboration
- Outsourcing/Reshoring
- Localisation

- A PhD research was integrated into the SME Strategy workshop toolkit as an additional step.
- This step added 10 min to the overall process but considerably enhanced the output (see next slide).
- It encouraged SMEs to consider external forces that may have an impact on the company strategy.
- This considerably enhanced the strategic actions the SME put in place.

Further details - Benefits at a glance (MTP programme)

Company sector	Length of project	Revenue £		Employees		Revenue per employee		Other
		Before	After	Before	After	Before	After	
Industrial electronics	9 months	1.2m	2.2m	11	14	109k	157k	Other new market opportunities leading to growth
Refrigeration	18 months	750k	2.1m	8	10	94k	210k	New practises released production capacity
Food	18 months	3m	4.8m	70	70	43k	69k	Delivery performance increased from 50% on time to >99% on time full
Chemical Treatment	12 months	1.7m	3.5	25	45	68k	78k	Defects halved in <6months
Laboratory equipment	12 months	5m	6.2m	32	32	156k	194k	Profits doubled
Smart metering	6 months	2.3m but falling	2.3m but raising	20	20	115k	115k	Defects halved in 4 months
Materials handling	4 years	10m not profitable	16m profitable	140	150	71k	106k	Moved into new markets
Food	18 months	6.8m	8.4m	75	75	91k	112k	Moved from breakeven to significant profitability
Packaging	18 months	3.2m	4.1m	48	48	67k	85k	Net profit more than doubled
Capital equipment	2 years	12m	35m	70	70	171k	500k	Growth in UK supply chain

Further details - Benefits at a glance (PrISMS program)

IfM ECS worked with 120 companies over three years during the PrISMS programme. The results from this programme were:

- Help create **126 new** jobs.
- **Safeguard 246 jobs**.
- Increase the **cumulative turnover** for 60 SMEs by **£18.8m (14%)** by improving the business strategy and capability development of these companies.
- **Reduce energy consumption** and minimise the environmental impact of manufacturing processes.
- Provide **feedback for new academic research** and develop new business support tools
- Transfer knowledge and skills to the SMEs to enable the companies to continue to improve after **PrISMS**

Further details

A recent article from the food sector (Braun & Hadwiger 2011) refers to EC/EU documents and lists challenges of knowledge transfers to SMEs (see Table 1) and suggests that this results in sub-optimal exploitation of publicly-funded research in Europe.

DONOR SIDEMost common barriers met when intending to transfer knowledge	RECEIVER SIDEMost common barriers met when intending to receive knowledge
Assumed benefits of possessing knowledge exclusively (Bruneel, D'Este & Salter 2010)	Lack of trust (Bruneel et al 2010; Grunert et al 2008; Santoro & Gopalakrishnan 2000)
Lack of ability to transfer knowledge to a non-specialist (Quillien & Vidal, 2003)	Lack of structures for knowledge processing (Santoro & Gopalakrishnan, 2000).
Lack of face-to-face contact to industry partner (Bruneel et al 2010)	Lack of knowledge concerning the know-how transfer process (Santoro & Gopalakrishnan 2000)
Language and culture barriers (Braun & Hadwiger, 2010; Quillien & Vidal 2003)	Language and culture barriers (Braun and Hadwiger, 2010; Carayannis et al 2006; Quillien & Vidal, 2003).

Table 1: Challenges of Knowledge Transfer to SMEs (from Braun & Hadwiger 2011)

Impressum

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