

Seek Project 2010:

Product Innovation Under Uncertainty

The Effect of Dynamic Resource Allocation

Motivation

- Firms have to balance costs and risks of investments in new products.
- Trade-off between pursuing a high number of innovation projects and focussing resources on the most promising projects
- Firms try to obtain high innovation success by combining flexibility (i.e. starting many projects) and sequential resource allocation (i.e. advancing projects step by step and stopping less promising projects)
- Sequencing of innovation projects may be particularly important when market and technology uncertainty is high
- Public funding of innovation projects rarely takes into account sequential project planning and stopping of projects with unfavourable prospects

Research Questions

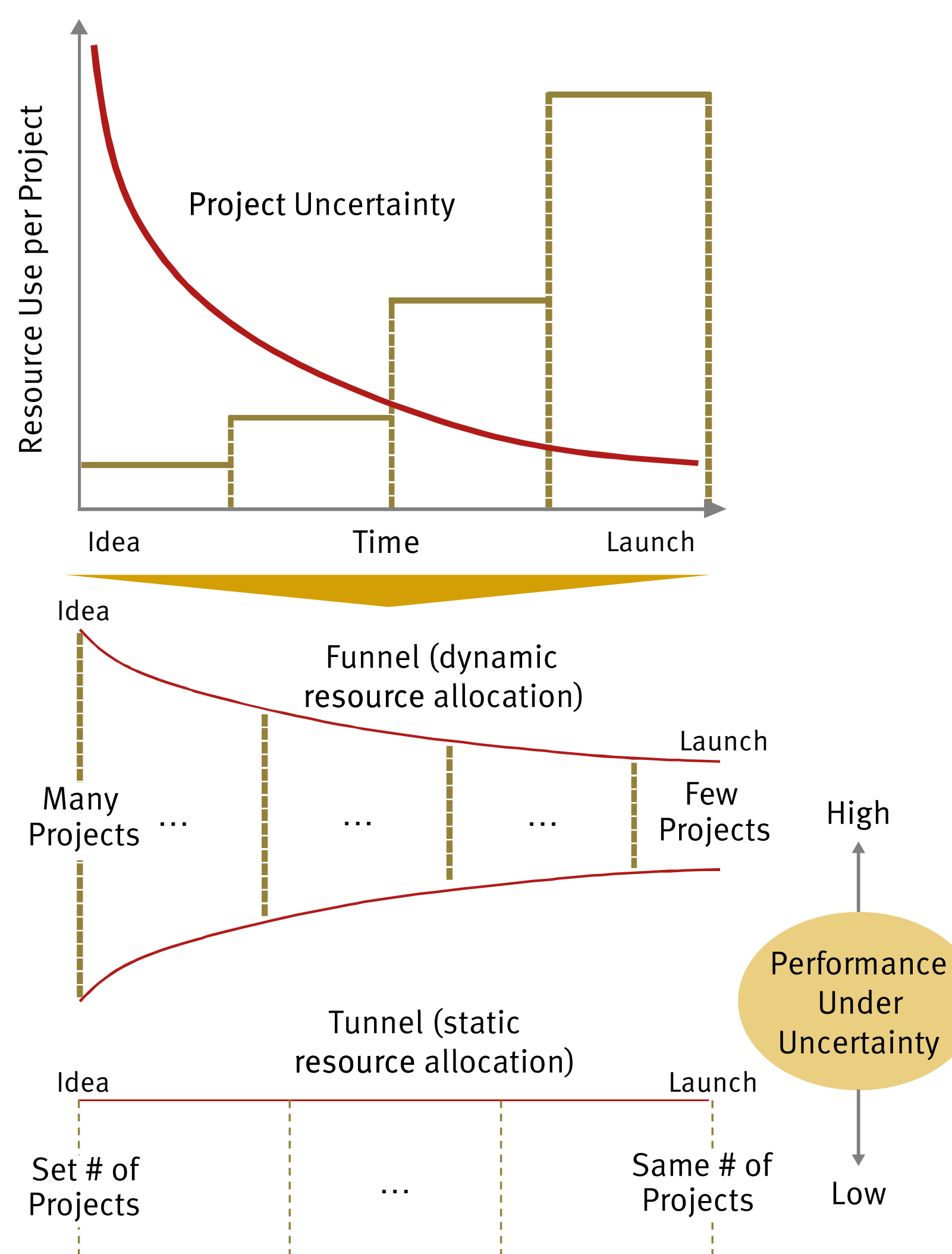
Does sequencing of investment in new product development reduce uncertainty over the likely success of innovation projects?

- Four hypotheses will be tested:
 - Exploring a greater number of innovation projects (= greater “breadth”) increases a firm’s chance of a lucky draw in uncertain environments.
 - Selectivity in allocating resources to ongoing innovation projects has an inverted U-shaped effect on innovation performance.
 - Sequential allocation of resources to innovation projects has an inverted U-shaped effect on innovation performance.
 - Uncertainty and selectivity both will increase the effect of breadth on innovation performance

Research Team

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Resource Allocation in the Product Innovation Process



Data

- Mannheim Innovation Panel (MIP), surveys 2009, 2010, and 2011: Additional questions on innovation projects and resource allocation

Example from MIP 2010

7.1 What was the number of successfully completed and untimely abandoned innovation projects in your enterprise during 2007 and 2009, and how many innovation projects were still ongoing at the end of 2009?

2007-2009 successfully completed projects (no.) ca. What was the share of projects that have fulfilled the original expectations completely? 0% ☐ 41-80% ☐ 1-20% ☐ 81-100% ☐ 21-40% ☐

2007-2009 untimely abandoned projects (no.) ca. How often did the following reasons cause abandonment of projects? very often often mean rarely very rarely

- Cuts in innovation budgets ☐ ☐ ☐ ☐ ☐

- Decreasing prospects of projects ☐ ☐ ☐ ☐ ☐

- Technical problems ☐ ☐ ☐ ☐ ☐

- Changes in strategic priorities ☐ ☐ ☐ ☐ ☐

At the end of 2009 still ongoing projects (no.) ca.

7.2 What was the typical duration of your innovation projects completed during 2007 and 2009 (from the idea to implementation)?

<6 Months ☐ 7-12 Months ☐ >1 - 2 Years ☐ >2 - 3 Years ☐ >3 Years ☐

7.3 Does your enterprise allocate the majority of funds for innovation projects one-off or step by step?

Step by step ☐ typically: 2 steps ☐ 3 steps ☐ 4 steps ☐ All one-off ☐ 5 steps ☐ 6 or more steps ☐

7.4 Please indicate to what extent the following statements apply for the management of innovation projects in your enterprise during 2007 and 2009.

Please tick one box in each line! fully applies mainly applies mean applies hardly applies does not apply

Your enterprise has clearly defined decision responsibilities for the allocation and denial of project resources ☐ ☐ ☐ ☐ ☐

Managers are rewarded for project completion ☐ ☐ ☐ ☐ ☐

Managers are also rewarded for efficient project discontinuation ☐ ☐ ☐ ☐ ☐

Not all innovative ideas are funded; innovation projects are intended to compete for resources ☐ ☐ ☐ ☐ ☐

Competitive allocation applies also to projects in more advanced stages of development ☐ ☐ ☐ ☐ ☐

Your enterprise operates processes to facilitate learning from discontinued projects for future innovation projects ☐ ☐ ☐ ☐ ☐

- Case studies in European telecommunication companies

Methods

a) Quantitative Analysis

- Impact of breadth (# innovation projects), selectivity (ratio of stopped to completed projects) and sequencing (# steps for allocating resources to projects) on product innovation success (new product sales, introduction of market novelties)

Base model:

$$\text{Innovation output}_i = \alpha + \beta_1 \ln(\text{sales}_i) + \beta_2 \frac{\# \text{ projects}_i}{\text{sales}_i} + \beta_3 \frac{\text{resources}_i}{\# \text{ projects}_i} + \beta_4 \frac{\# \text{ stopped projects}}{\# \text{ completed projects}} + \beta_5 \# \text{ steps of resource allocation} + \sum_4 x_i \varepsilon_i$$

X being a vector of control variables (R&D activities, human capital, sector affiliation, etc.)

- Splitting samples/introducing interaction terms to disclose a likely moderating effect of uncertainty (fluctuation of demand, predictability of behaviour of competitors and clients) and selectivity

b) Qualitative Analysis

- Document analysis, interviews, and process observation
- 10–15 people from new product portfolio and process management, selected innovation project managers, individuals involved in budget setting and stage-gate decision-making
- Interviews with public innovation programme managers

Flexible Resource Allocation in Innovation

Key Figures from the Mannheim Innovation Panel, 2009–2010

Product innovators only	mean
Innovation projects (number per firm)	19.3
Resources per project (1,000 €, mean)	780
Projects per m€ sales (number)	3.6
Firms with stepwise resource allocation	21%
Steps of stepwise resource allocation (number)	3.0
Stopped per completed projects (ratio)	0.15
Firms with stopped projects	22%
Reasons for stopping projects (share of firms with stopped projects stating “very often” or “often”)	
– Cut in budgets	70%
– Decreasing prospects	32%
– Technical problems	33%
– Change in strategic priorities	40%
Competitive allocation of project resources also in more advanced states of development (share)	18%

Preliminary Results for the Role of Breadth

	I Base	Ila Low Uncertainty	Ilib High Uncertainty	Illa No Selectiveness	Ilib Selectiveness
New Product Sales (ln) – OLS					
Breadth	0.016*** (0.006)	0.013 (0.011)	0.029** (0.013)	0.008 (0.006)	0.024** (0.010)
Sales	0.896*** (0.019)	0.919*** (0.029)	0.899*** (0.031)	0.863*** (0.032)	0.922*** (0.026)
Resource Intensity	0.013*** (0.005)	0.012** (0.006)	0.016* (0.010)	0.029* (0.087)	0.009*** (0.003)
Graduate Employees	0.630*** (0.132)	0.357 (0.476)	0.841*** (0.214)	0.637*** (0.193)	0.571*** (0.171)
Continuous R&D	0.412*** (0.070)	0.494*** (0.101)	0.252*** (0.097)	0.540*** (0.094)	0.160* (0.091)
Process Innovator	0.350*** (0.060)	0.417*** (0.101)	0.387*** (0.093)	0.455*** (0.083)	0.212*** (0.081)
Industry Dummies	incl.	incl.	incl.	incl.	incl.
Constant	-1.521*** (0.210)	-1.758*** (0.310)	-1.474*** (0.366)	-1.352*** (0.322)	-1.506*** (0.307)
F	191.4***	94.54***	109.05***	86.59***	105.90***
R2	0.73	0.72	0.72	0.64	0.82
Market novelty (0/1) – Probit ML					
Breadth	0.016*** (0.005)	0.010* (0.006)	0.025*** (0.009)	0.013** (0.006)	0.021*** (0.007)
Sales	0.034*** (0.009)	0.029** (0.015)	0.038** (0.015)	0.031*** (0.012)	0.039*** (0.015)
Resource Intensity	-0.002 (0.003)	0.003 (0.004)	-0.008 (0.006)	-0.016** (0.007)	0.004 (0.005)
Graduate Employees	0.145** (0.070)	0.038 (0.119)	0.184* (0.110)	0.121 (0.094)	0.190* (0.106)
Continuous R&D	0.238*** (0.028)	0.230*** (0.043)	0.266*** (0.047)	0.238*** (0.035)	0.230*** (0.051)
Process Innovator	-0.022 (0.028)	-0.063 (0.044)	0.049 (0.045)	-0.034 (0.035)	0.013 (0.047)
Industry Dummies	incl.	incl.	incl.	incl.	incl.
Log Likelihood	-1004.6	-415.4	-394.5	-602.1	-385.9
Wald chi2	179.3***	76.26***	80.79***	99.26***	90.60***
Pseudo R2	0.09	0.08	0.11	0.08	0.11
# observations:	1,590	654	642	954	636

***, **, *: effects statistically significant at the 1, 5, and 10 percent level, respectively.

First Findings (Preliminary)

- Pursuing a higher number of innovation projects (“breadth”) increases the likelihood of generating new-to-market products
- Breadth-oriented strategy enhances new product sales in uncertain markets only
- Breadth combined with selectivity yields higher innovation success, because selectiveness contains the organizational costs of breadth

Next Steps

- Carry out robustness checks; replicate on 2010 data
- Analyse new 2010 questions/responses as to the organizational fit between resource allocation policy and reality
- Conduct in-depth case study research in selected high-uncertainty sectors (i.e. telecommunications)