

NIJMEGEN SCHOOL OF MANAGEMENT

**Center for Innovation Studies**

## **Effective Alignment of Innovation**

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## In collaboration with our EMS-partners

<http://www.european-manufacturing-survey.eu>

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**Anniversary: start production T-ford “Thin Lizzy”  
in October 1908**





<b>T-ford</b>	4 cylinder engine: Speed: Weight: Price:	3 liter 70 km, 20 hp 540 kg 850 dollars	<b>production:</b>
1908	Start production		
1910	Experimenting on the assembly line		32,000
1913	Well functioning assembly line	"Fordism"	
1916		Price: 360 dollar Productivity: 8 x wage: 5 dollar per hour	750,000
1927	End production T-ford		> 15 million



## Research Objectives

- To determine different performance effects of different types of innovation;
- Effective Alignment of Innovation
  - To gain insight in the performance effects of the interplay of different types of innovation.



## Main Dimensions of Innovation

- Technological innovation – Administrative innovation
  - Daft, 1978; Damanpour, 1991; Cooper, 1998
- Process innovation – Product innovation
  - Damanpour, 1991; Cooper, 1998; Tidd et. al., 2005



## Two dimensional model of Innovation

	Technological	Non-Technological
Process	Process Technology	Organisational Process
Product	Product innovation	Product related Services

Classification of different Innovation policies (Kinkel, Lay & Wengel, 2005)



## Shift from determinants to effects of Innovation

- Main focus has been on determinants of (the types of) innovation (cf. Totterdell et al., 2002), e.g.
  - large, complex, participative firms, more product innovation (Scuilli 1998)
  - research oriented small firms, more product innovations (Rothwell's 1983)
  - small (banking) firms adopt more process innovation (Scuilli 1998)
  - organisation size, more innovation activity (Anderson & King 1993)
- 'Different types of innovation, or innovations possessing different characteristics, will have a differential impact on the various consequences of innovation' (Totterdell et al. 2002, p. 345).
  - Different types of innovations affected stakeholders differently, e.g.
    - administrative innovation benefits employee relations
    - Product related services benefits customers



## To zoom in on outcomes of innovation:

- to provide insights for companies to set up a coherent innovation policy
- Using multiple performance indicators
- Focus on operational efficiency (benefits for the company)
- Indicators relevant for customers and employment



## Research hypotheses

- Differential effect of types of innovation on performances  
(Differential hypothesis)
  - Different types of innovation affect different indicators of business performance
- Alignment of types of innovation increases performance  
(Alignment hypothesis)
  - Coherence between types of innovation increase business performance

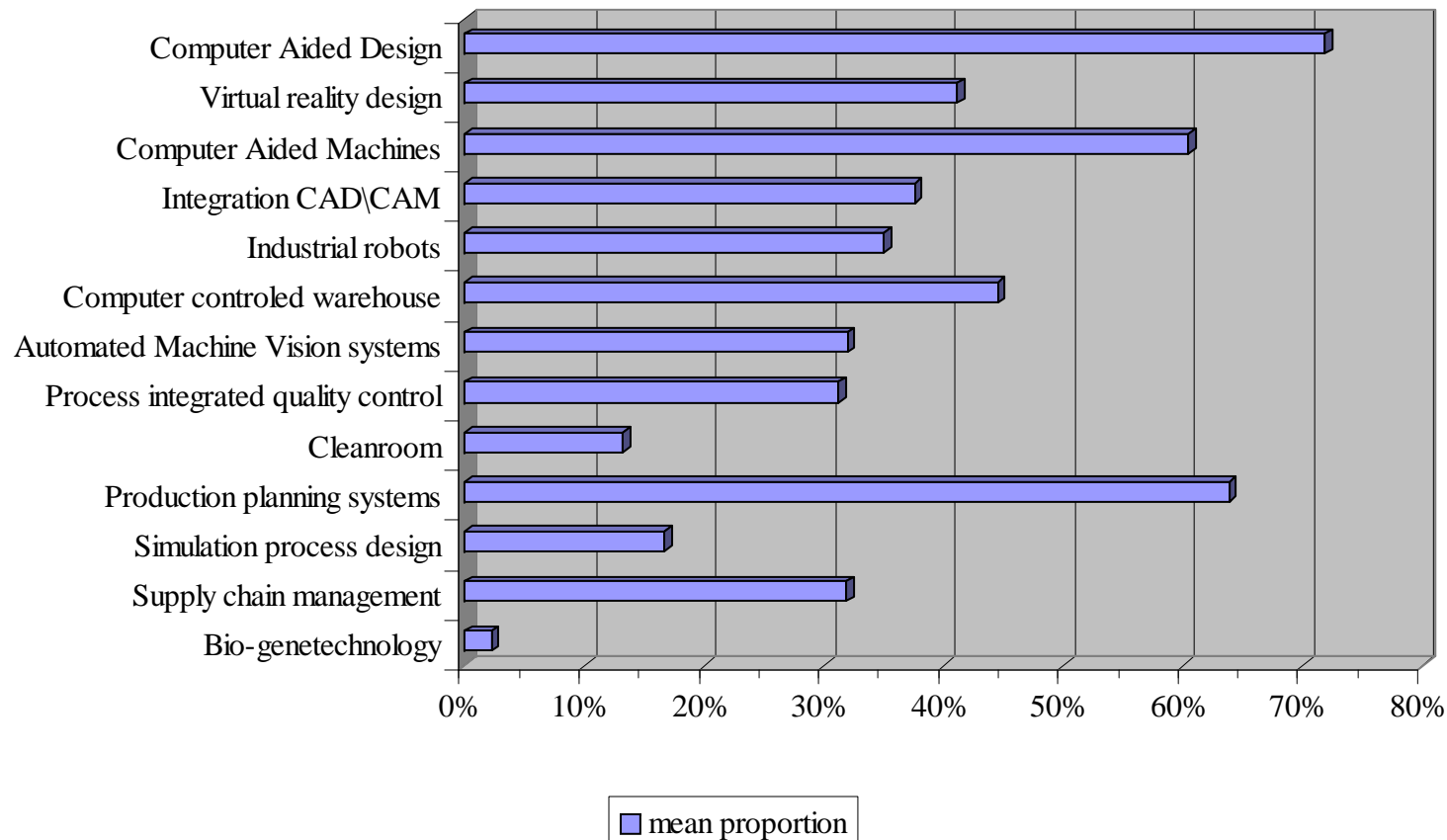


## Methodology

- European Manufacturing Survey 2006-7
  - Topics: utilisation of specific (recent) innovations in: production process, new organisational concepts, and product related services; also performance indicators, outsourcing activities, collaboration, staffing, ...
  - 3344 production plants in the manufacturing Industry (NACE 15-37; >10 employees; focal respondent: managing director / plant manager)
  - Multinational survey in 9 countries: (Germany, Switzerland, Austria, Spain, France, Croatia, Turkey, Slovenia, Netherlands)
  - Different branches of the Manufacturing Industry: (Metal, Food, Textile, Construction, Chemical, Machinery, Electronic, Transport)
  - Participation incentive: on-line benchmarking  
Website: <http://www.european-manufacturing-survey.eu>



## Operationalisation & Scaling: Process Technology Innovation



- average number of innovations per plant:

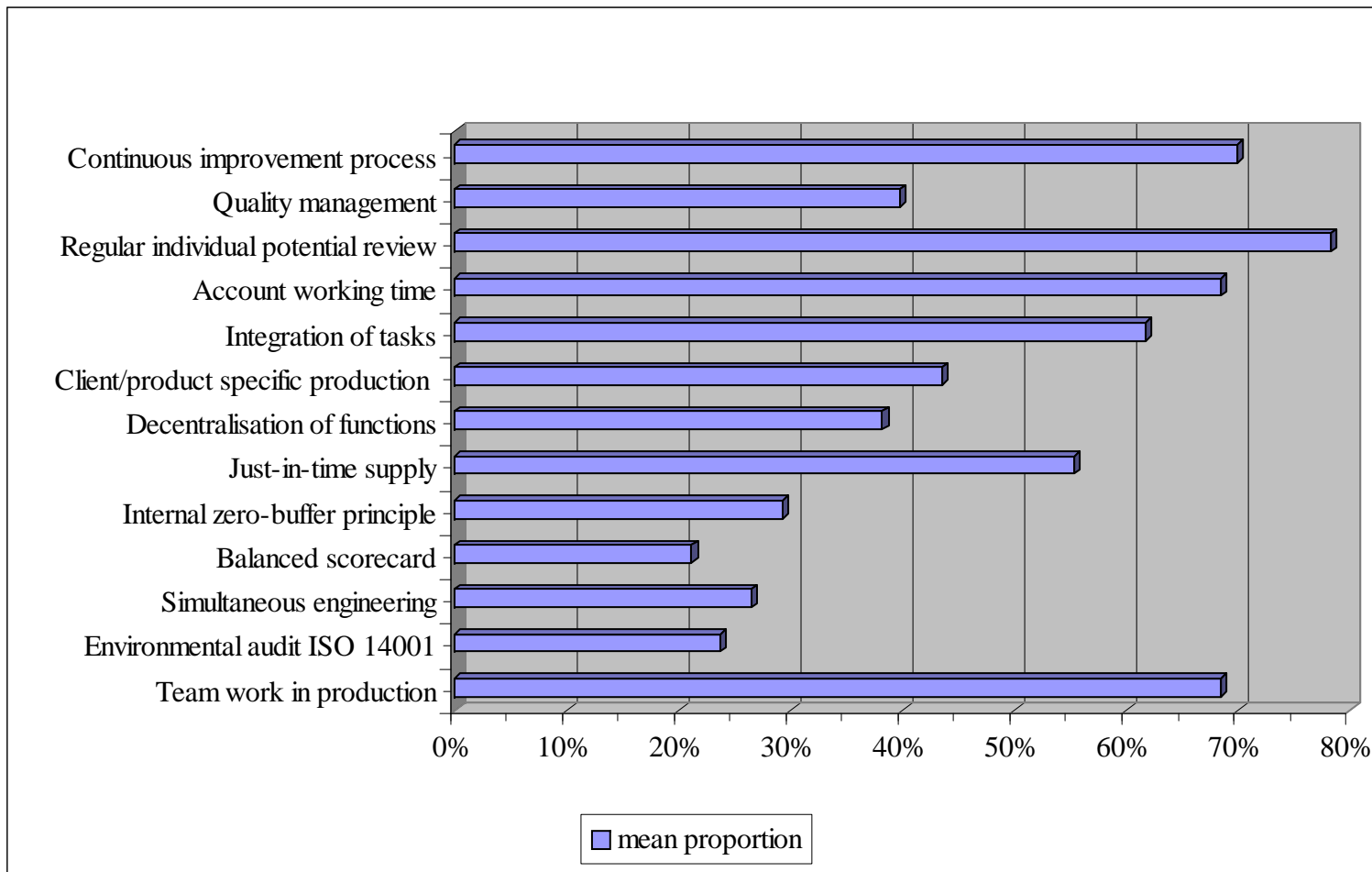
**4.8 innovations**

Reliability:

- Cronbach's alpha: 0.76;
- N=3150;



## Operationalisation & Scaling: Organisational Process Innovation



- average number of innovations per plant:

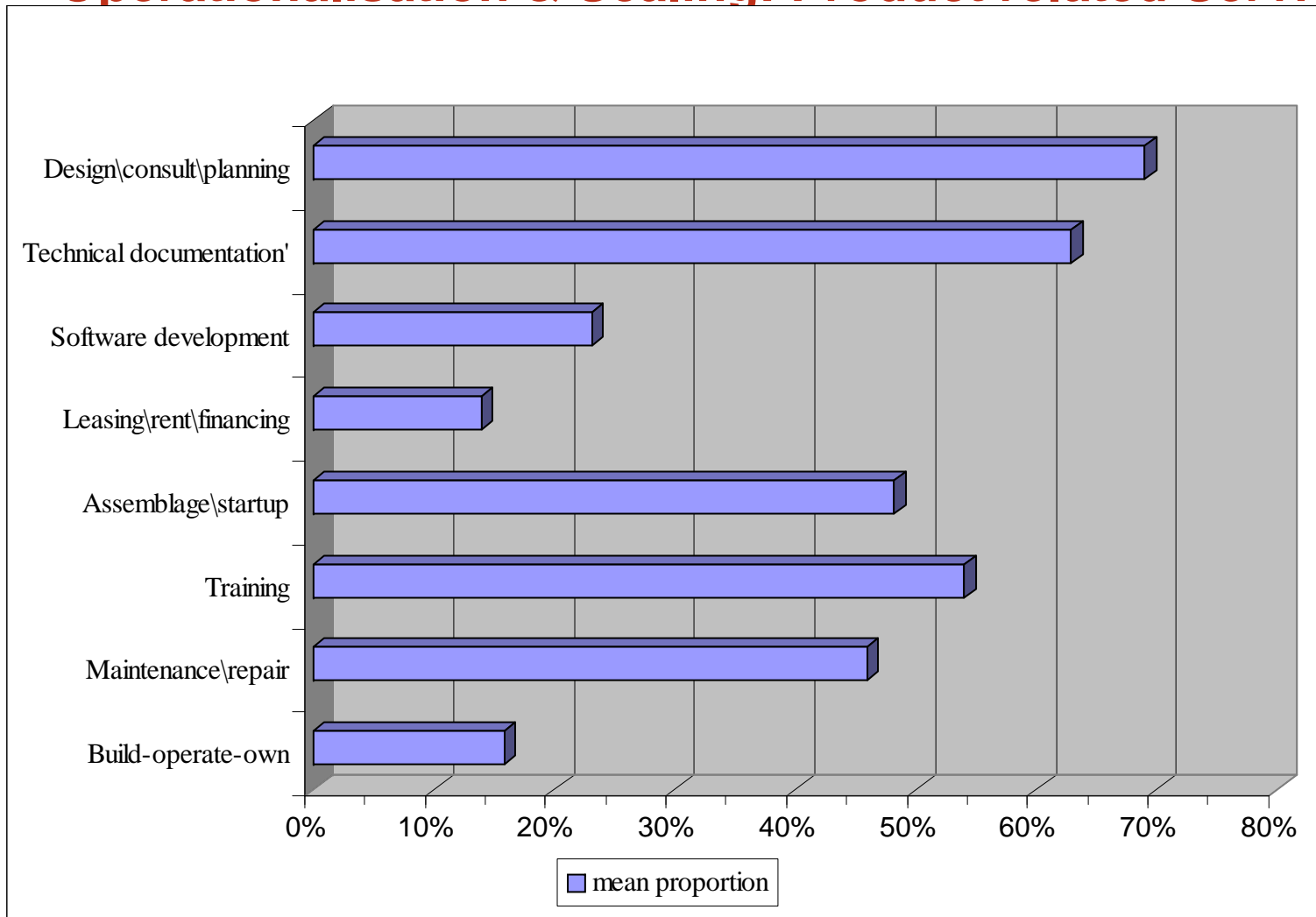
**6.2 innovations**

Reliability:

- Cronbach's alpha: 0.73;
- N=2708;



## Operationalisation & Scaling: Product related Services



- average number of innovations per plant:

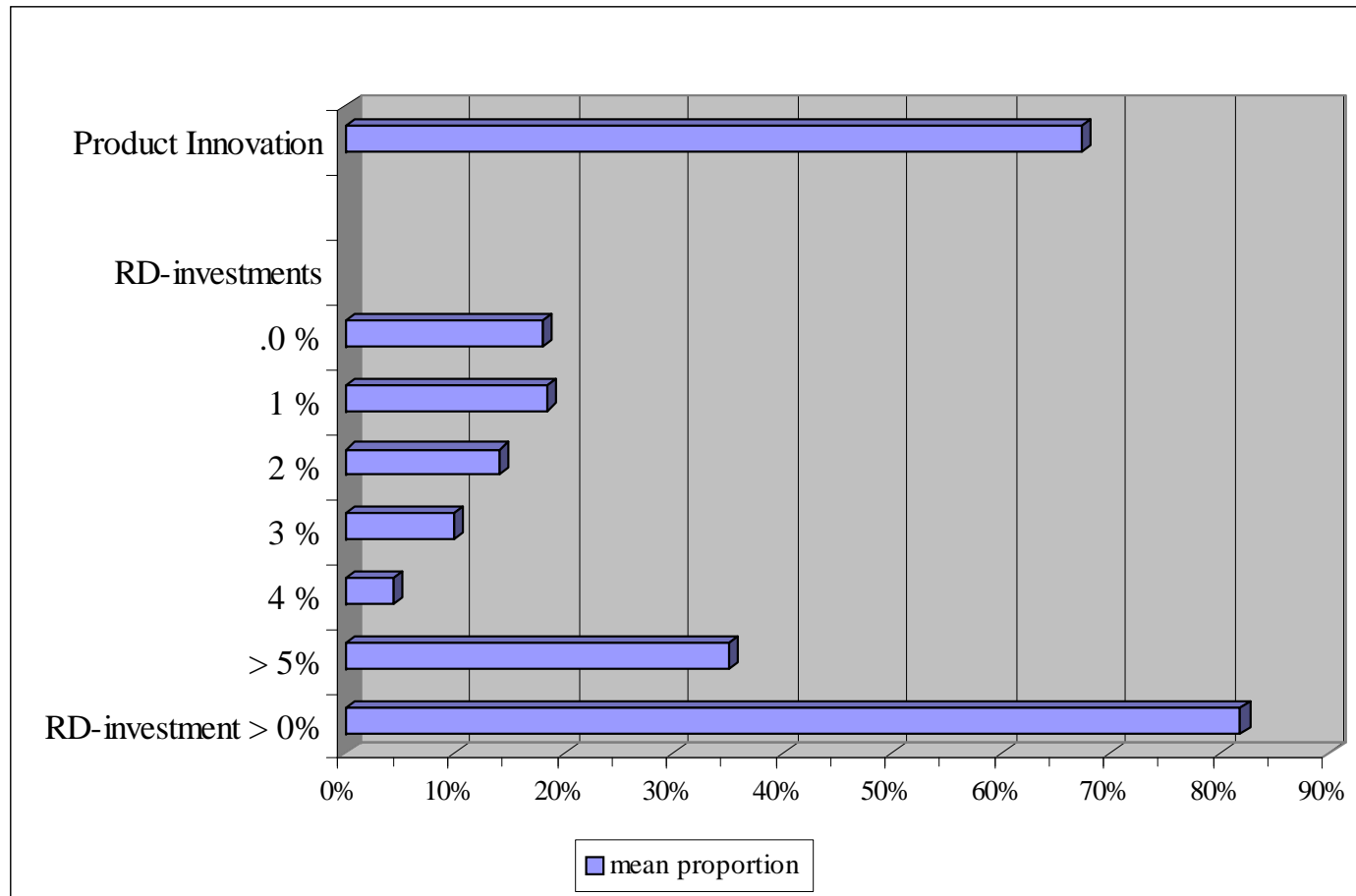
**3.3 innovations**

Reliability:

- Cronbach's alpha: 0.78;
- N=3268;



## Operationalisation: Product Innovation \ RD-investments



- Product-innovation  
N=3344

- RD-investments  
(share turnover)  
N=2184



## Descriptives: Performance Indicators

Performance Indicators		Mean	Unit
I	DeliveryTime	41.97	day
II	OnTime	89.21	% orders
III	ScrapRate	3.06	% products
IV	ProdLeadTime	562.10	hour
V	SetupTime	208.74	minute
VI	Egrowth	1.42	employee



## Overview of the Differential and Alignment effects of Types of Innovation on Performances

	Delivery Time	OnTime	Scrap Rate	ProdLead Time	Setup Time	Egrowth
<b>Types of Innovation</b>						
Product innovation	+	+				-
Process Technology	+				++	
Organisational Process	-	++	--			
Product related services	++		+	++		
<b>Alignment of Innovation</b>						
Technology and Organisational Process	-	+	-	-		
Technology Process and Product related Services						+
Technology and Product innovation						
Organisational process and Product related services			-			
Organisational process and Product innovation						
Product related services and Product innovation						

(controlled for Size, Country, Industry, and RD-investments)



## Conclusions I

- Performance effects of types of innovation
  - Differential effect of different types of innovation
  - Multiple performance effects of innovation with positive and negative outcomes for the organisation)
  - Outcome of Organisational Process Innovation (only positive effects)
- Alignment of Innovation (policies) suggests “best innovation policies” for the company:
  - In particular combining Organisational Process Innovation *and* Process Technology innovation (broad coverage of performance indicators; only positive effects)



## Conclusions II

- Note that the findings highlight the important role of **Organisational Process Innovation** (positive main effects as well as positive alignment effects in combination with Process Technology innovation)
- Limitations:
  - Cross-sectional survey: no causal inferences
  - Effects are relatively small, additional insights necessary
- Further research:
  - Search for “best practices”, i.e. best performing configurations of specific innovations;
  - Path dependencies between Organisational Process innovations and Process Technologies;



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# Alignment of specific innovations

## Innovation profile\_A

### Effect on Performances:

DeliveryTime: - - -

OnTime: -

ScrapRate: -

ProdLeadTime: - -

SetupTime: +

Egrowth: +

Label	Type	Level_1
Computer Aided Machines	tp	
integration CAD\CAM	tp	
virtual reality design	tp	
Computer Aided Design	tp	
Assemblage\startup	ps	
Maintenance\repair	ps	
Training	ps	
Design\consult\planning	ps	
Technical documentation	ps	



# Alignment of specific innovations

## Innovation profile\_B

### Effect on Performances:

DeliveryTime:

OnTime: +

ScrapRate:

ProdLeadTime:

SetupTime: +

Egrowth:

Label	Type	Level_1
computer controled warehouse	tp	
production planning systems	tp	
continuous improvement process	op	
regular individual potential review	op	
account working time	op	
integration of tasks	op	
team work in production	op	
just-in-time supply	op	



# Alignment of specific innovations

## Innovation profile\_C

### Effect on Performances:

DeliveryTime: ++  
 OnTime: ++  
 ScrapRate: +  
 ProdLeadTime: ++  
 SetupTime: - -  
 Egrowth:

Label	Type	Level_1
automated Machine Vision systems	tp	
process integrated quality control	tp	
industrial robots	tp	
simulation process design	tp	
supply chain management	tp	
simultaneous engineering	op	
balanced scorecard	op	
environmental audit ISO 14001	op	
internal zero-buffer principle	op	
client/product specific production	op	
decentralisation of functions	op	
quality management	op	
new products for firm and market	pi	



# Alignment of specific innovations

## Innovation profile\_D

### Effect on Performances:

DeliveryTime: -

OnTime:

ScrapRate:

ProdLeadTime: -

SetupTime:

Egrowth:

Label	Type	Level_1
Bio-genetechnology	tp	
cleanroom	tp	
Leasing\rent\financing	ps	
Build-operate-own	ps	
Software development	ps	
new products for firm only	pi	
no pi	pi	
0-1% RD investments	rd	
2-3% RD investments	rd	
1-2% RD investments	rd	
3-4% RD investments	rd	
>5% RD investments	rd	
no RD investments	rd	
missing RD investments	rd	