



Innovation and its Diffusion The Aeronautical Case


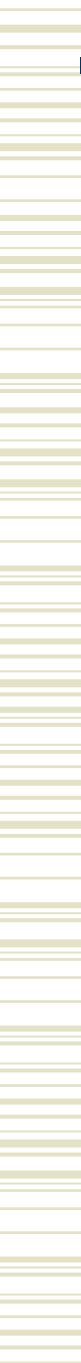

IKINET PROJECT


Javier Alfonso Gil

Universidad Autónoma de Madrid

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- ◆ Initially we assume two large categories of industrial firms.
 - ◆ Small and medium industrial firms (SMEs) inserted in a local milieu and operating mainly in competitive markets where price is crucial.
 - ◆ Large firms (LFs) which tend to participate in increasingly global oligopolistic markets where innovation is crucial.

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- ◆ Our objective will be to answer the following two questions:
 - ◆ How can the process of generating and diffusing innovation be explained?
 - ◆ How well does that process fit the aeronautical case?

◆ LFs in oligopolistic competition



Respond with routine R+D (Innovation)



But need to charge $P > MC$ to recoup costs



Because they know innovation is a public good



Therefore, the economic rents are temporary

- ◆ SMEs acting as price takers



Respond with cluster technology which imitates but doesn't innovate

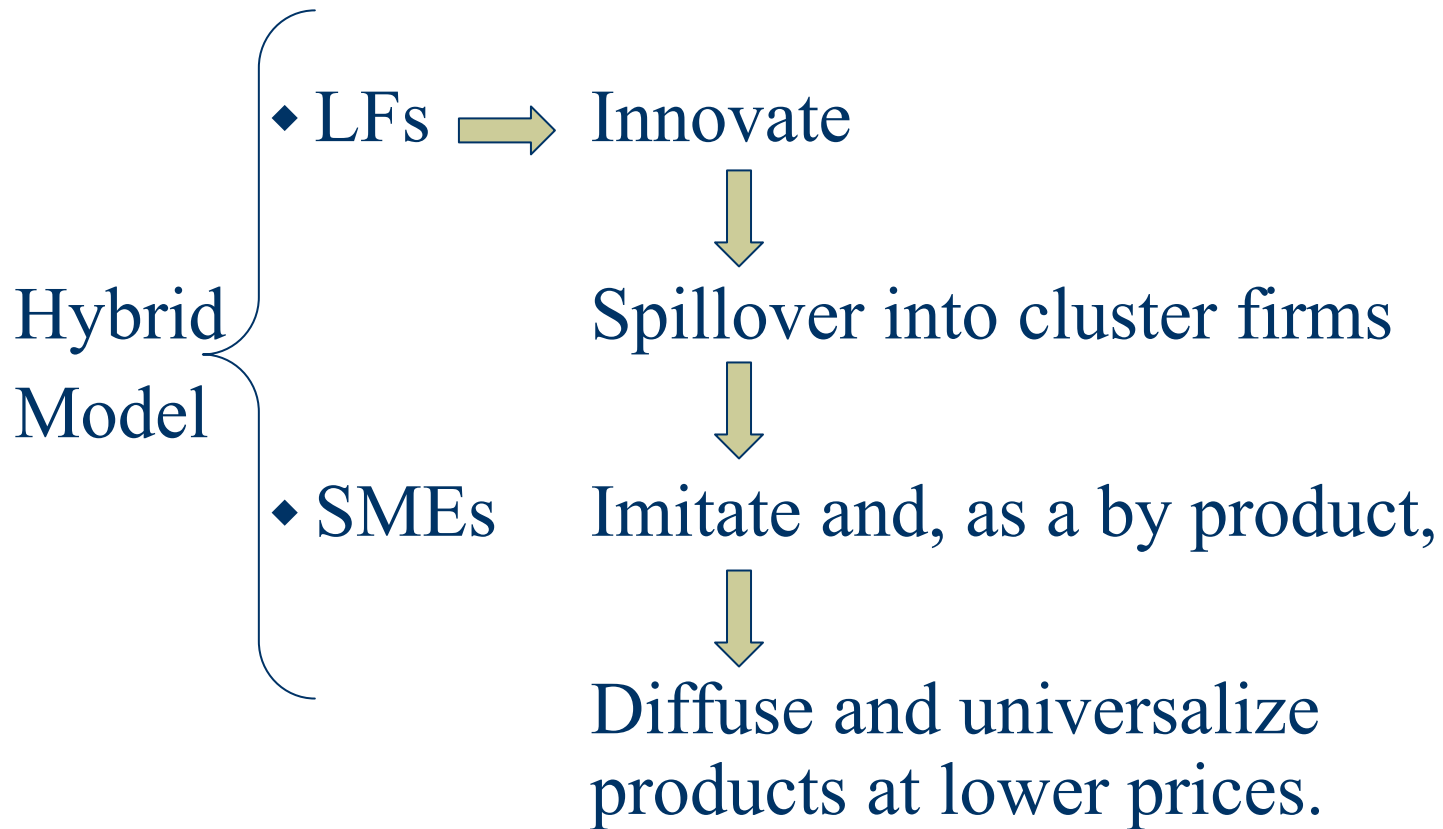


Can only charge $P=MC$



Must adopt and adapt just to stay in the same **position**

■ The Dynamics



Aeronautical Sector: From production to transaction costs

Arsenal Mentality

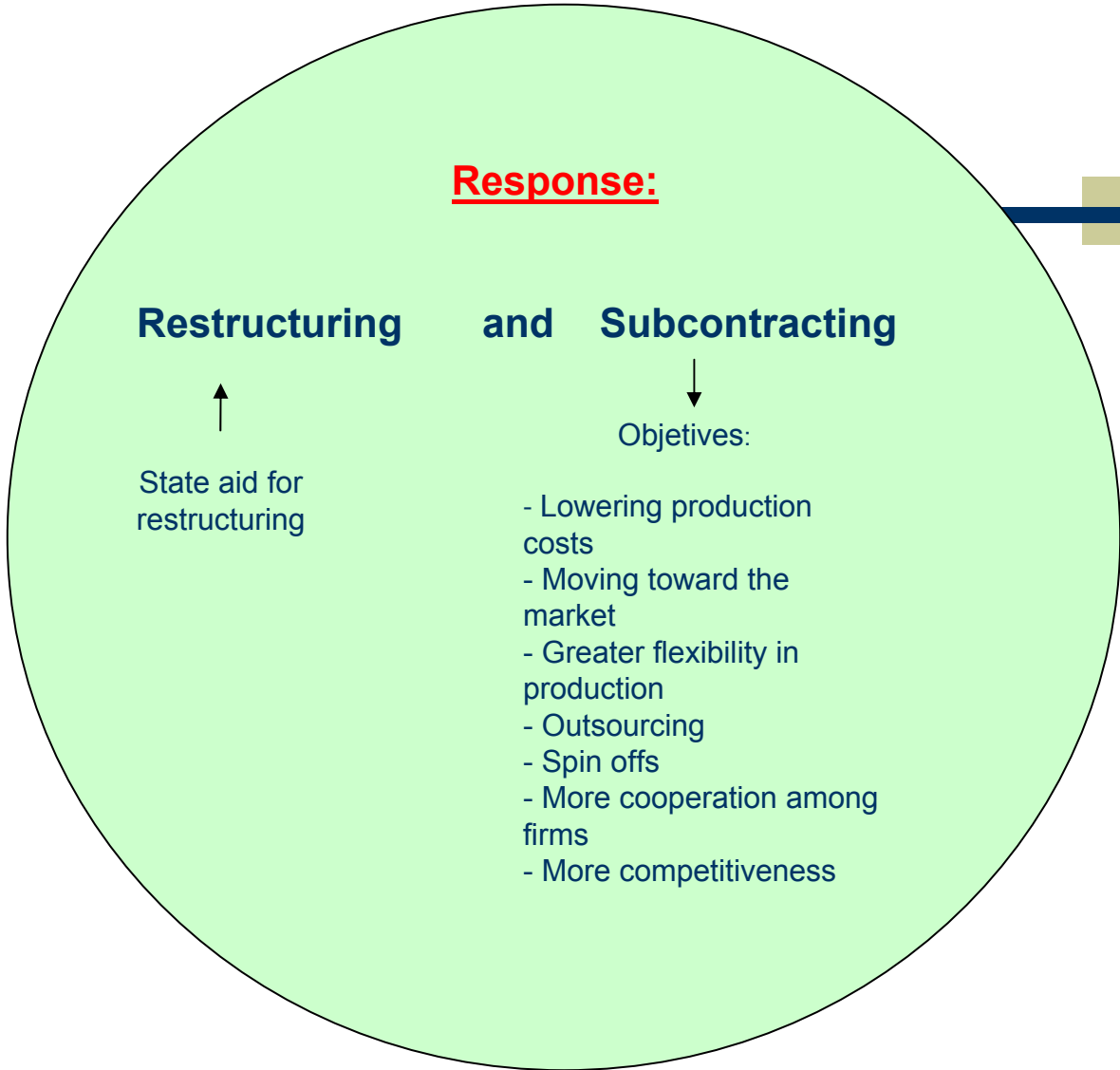
Sector as a Defense Public Good

Characteristics:

- State budget support
- Knowledge as a Public Good
- Production Chain, mainly “in house” production
- High Technological Level
- No cost conscious
- Relatively removed from the market.

Results:

Tendency to high
production costs



Results for EADS/AIRBUS

High transaction costs



- Explosion of Enterprises
- Contract management difficulties
- Coordination problems
- Increase in the number of quality certificates
- Delay on production time

Response:

Tendency to reduce subcontracting



New contract terms in EADS/AIRBUS

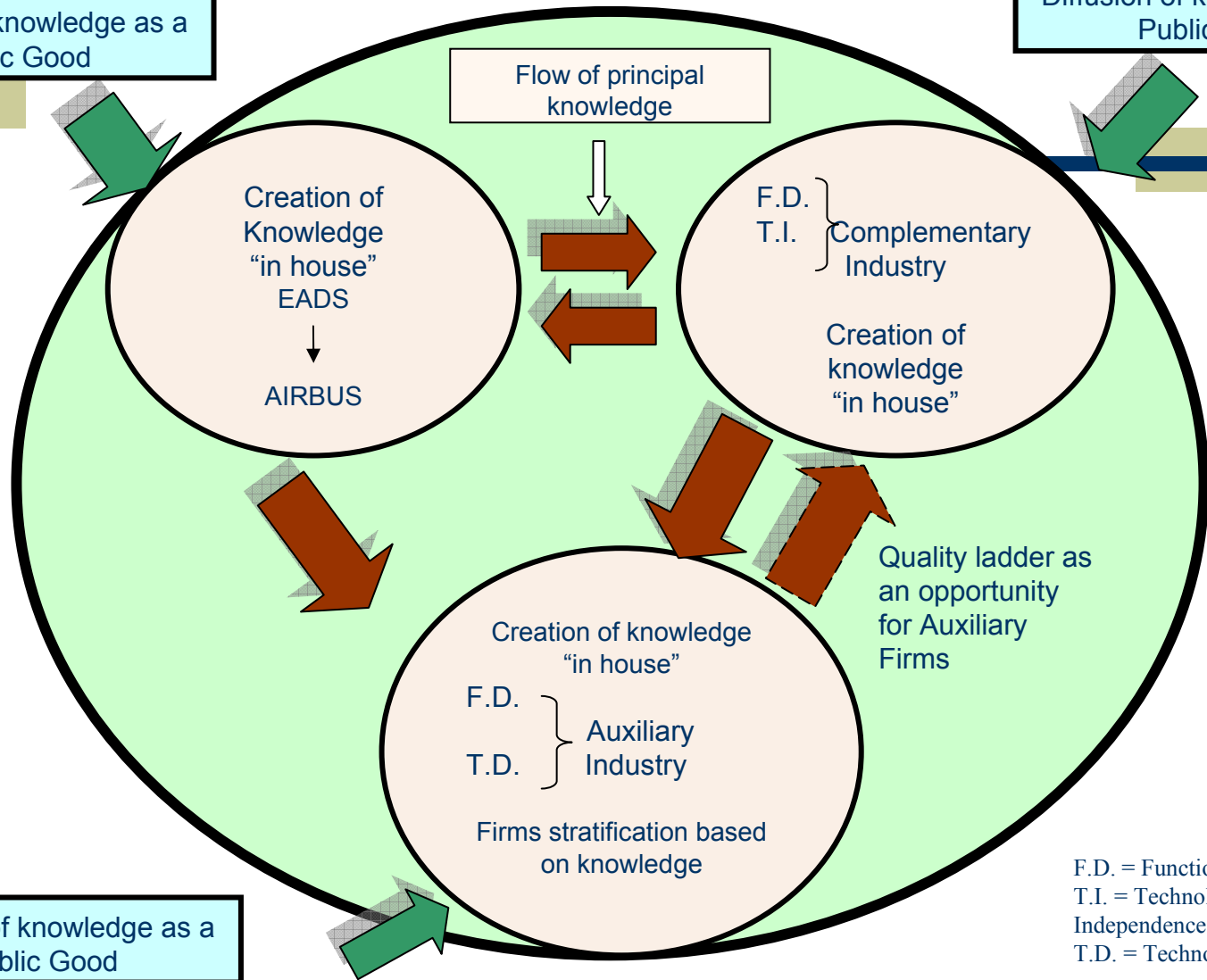


- Increase of subcontracting (in volume terms)
- Decrease of number of subcontracting firms (quantity)
- Increase use of I.T. among enterprises.
- Need to increase the SME strength

KNOWLEDGE FLOW EADS / AIRBUS*

Diffusion of knowledge as a Public Good

Diffusion of knowledge as a Public Good



Diffusion of knowledge as a Public Good

F.D. = Functional Dependence
T.I. = Technological Independence
T.D. = Technological Dependence

ENTERPRISE	WORKFORCE	R+D employees	SELLING V° (million €)	KNOWLEDGE FLOW
MAIN ENTERPRISE				
EADS / CASA	5141	10% (514)	813 €	Capacity to produce complete processes of manufacture-Integration of aeroplanes. Creator of knowledge.
AIRBUS	2272	19% (432)	468 €	
1st LEVEL SUBCONTRACTOR				
GAMESA AERONAUTICA	1552	17% (263)	233 €	Creator of knowledge. Complementary Industries. Independent technologically. Functional dependent.
INDRA	5200	8% (416)	607.4 €	
SENER (BOREAS)	89	6% (5)	4 €	
CESA	212	23% (49)	32 €	
2nd LEVEL SUBCONTRACTOR				
TECNOBIT	159	2% (3)	22 €	SME. Functionally and technologically dependent. Capacity of design and specific engineering development.
AERLYPER	51	4% (2)	7 €	
TGA/TEGRAF	100	5%(5)	10,10 €	
GRUPO TAM	300	1% (3)	11,90 €	
3rd LEVEL SUBCONTRACTOR				
APRIM	46	2% (1)	5 €	SME. Functional Dependence Technological Dependence. Work under blue print.
INDUSTRIA CARMORA	19	0	2 €	
RAMEN	19	16% (3)	1.5 €	
QUALITY METAL	17	0		
GAZC	11	0	4.9 €	

INDRA

Knowledge Creation and Diffusion:

1st level Subcontractor. Main activity: electronic systems (knowledge independence)

- ◆ High level of knowledge creation (in house)
- ◆ 7% of its budget to R+D
- ◆ High quality of human capital
- ◆ High level of cooperation with clients and other actors
- ◆ Internationalization (present on more than 40 countries)
- ◆ Knowledge flow: interactive with other suppliers
- ◆ 4.7 en I+D (7.7% del total)

Nº employees	6092 (corporation) 5200 in Madrid
R+D employees	416
R+D cost	20.4 mill € (corporation)
Main Cooperating actors	Ministerio de Defensa español AENA Agencia Espacial Europea Organismo de control de tráfico aéreo alemán SOGECABLE

INDRA consists of

- ◆ Head Enterprise: INDRA SISTEMAS, S.A. (Madrid, España)
- ◆ INDRA ATM, S.L. (Madrid, España)
- ◆ INDRA EMAC, S.A (Madrid, España)
- ◆ INDRA Espacio, S.A. (Madrid, España)
- ◆ INDRA Sistemas de Seguridad, S.A. (Barcelona, España)
- ◆ INDRA SI, S.A. (Buenos Aires, Argentina)
- ◆ INDRA Médica, S.A. (Buenos Aires, Argentina)
- ◆ Tecnologías de la Información Avanzada del Perú (Lima, Perú)
- ◆ Europraxis Atlante, S.L. (Barcelona, España)
- ◆ Sistemas Integrales Indra Seguridad, S.L. (Madrid, España)
- ◆ INMIZE Capital, S.L. (Madrid, España)
- ◆ INDRA Chile, S.A. (Santiago de Chile, Chile)
- ◆ Europraxis Consulting Brasil LTD (Brasil)
- ◆ INDRA CPC, SGPS (Lisboa, Portugal)
- ◆ Europraxis Group Argentina, S.A. (Argentina)
- ◆ INDRA Italia, S.r.l. (Roma, Italia)
- ◆ INDRA Beijing Information Technologic System (Beijing, China)
- ◆ INDRA Systems Inc. (Orlando, USA)
- ◆ INDRA do Brasil Ltd (Brasil)

TAM

Knowledge Creation

2nd level subcontractor. Main activity: manufacturer of machinery tools

- Knowledge dependent
- Manufacturing of machinery tools
- Low level of Knowledge creation (in house)
- Increase in recent times of capacity of design and specific engineering development
- Need of more personnel in R+D
- Lack of I.T. (platforms)

N° employees	300
R+D employees	3
R+D cost	595000 € (5%)
Main Cooperating actors	Airbus GMBH (Germany) Eurocomposites AG (Luxemburg) Fischer FCC (Austria) Fokker Stork (Holand)

RAMEN

3rd level Subcontractor. Main activity: high quality machine tools

- ◆ Knowledge dependent
- ◆ Work through blue prints
- ◆ Subcontractor of 1st level firms
- ◆ Diversification of sectors (automobile)
- ◆ High level of cooperation
- ◆ Need of personnel in R+D
- ◆ Lack of I.T. (platforms)

Nº employees	13
R+D employees	3
R+D cost	270000 €
Cooperating actors	Instituto de Microelectrónica y sincrotrón de la Universidad Autónoma de Barcelona (España) Universidad Politécnica de Madrid (España) Universidad de Yale (USA) Centro Español de Metalurgia

Conclusions

LFs Innovate (creation of something new) mainly in oligopolistic markets ($P > MC$), but with spillovers over the rest of the industry.

- ◆ SMEs Adopt and adapt with rapid diffusion and universalization of products ($P = MC$)
- ◆ The aeronautical sector behaves well with the above conditions