Managing knowledge and human resources in knowledge intensive industries in emerging economies

The case of Indian ICT industry

Norio Tokumaru
(Nagoya Institute of Technology, JAPAN)
e-mail: tokumaru.norio@nitech.ac.jp

Structure of the presentation

1. Introduction

2. Nature of the ICT cluster

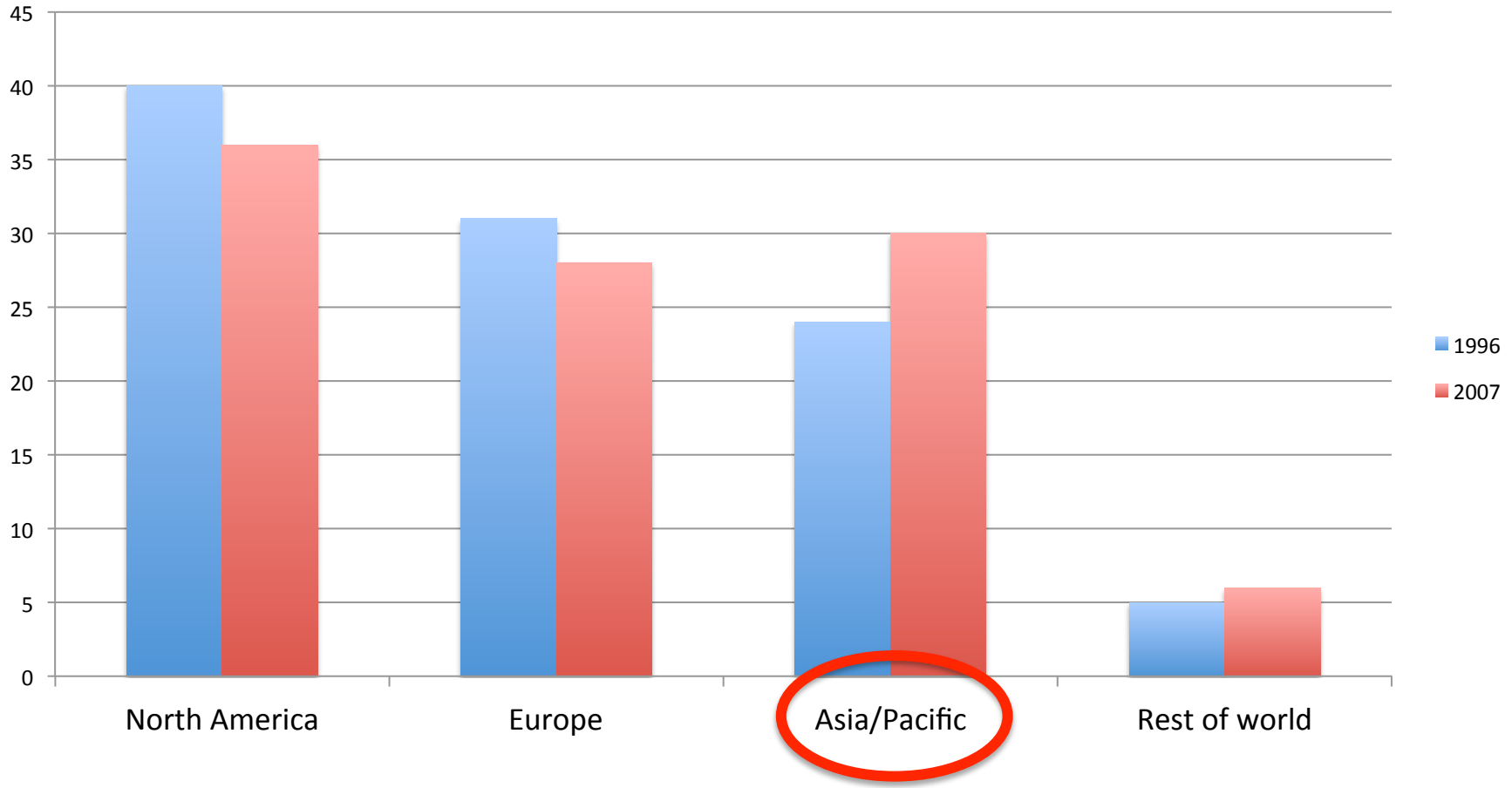
3. Empirical Analysis

4. Discussion and Conclusion

1. INTRODUCTION

Shift in the locus of R&D

Share of R&D expenditure in the world in 1996 and 2007



Science and Engineering Indicators 2010
(National Science Board)

→Shift to the Asia

Upgrading of the Indian ICT industry: Why? How?

- From a **low-cost site** for knowledge work
  to a center for development of **latest technology and products**

For Boeing: HCL

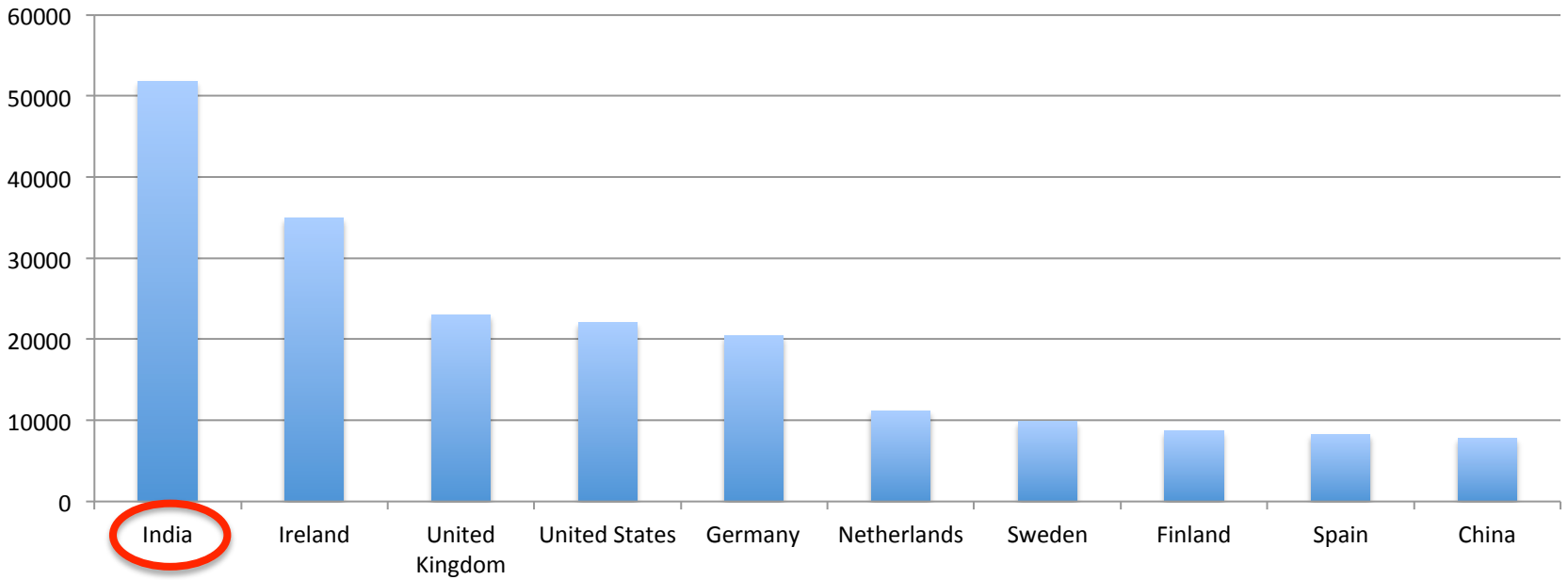
For Airbus: Infosys

Smart phone by Lava

- **Upgrading** of the industry is evident. Mounting evidences.
- But, we have little knowledge as to how they manage **knowledge** and **human resources**, which support this **upgrading**.
- We focus on the emerging systems of **knowledge management** and **HRM (human resource management)** in this paper.

Strong export-orientation

Export of ICT services（Million USD, 2008）



(*OECD IT Outlook*, 2010)

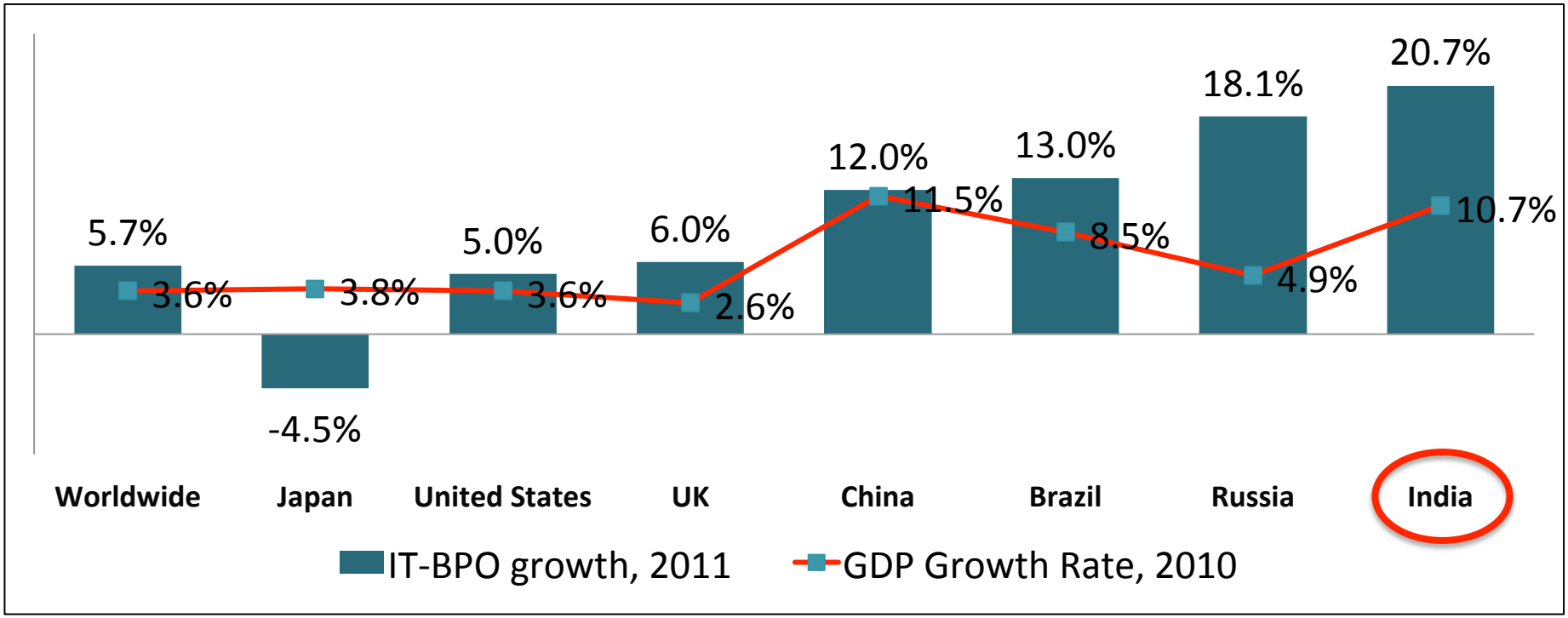
■**7.1%** of GDP
(2011：NASSCOM, 2012)

■Average export/sales=**64.0%**
(2008：NASSCOM, 2009)

■Export/sales in top 5 companies=**95-98%**
(2008: Financial statement)

But, growing domestic market for ICT

Rapid growth in the domestic ICT market



NASSCOM (2012)

Still following the *stagnant model*?

Previous researches on the Indian ICT industry

■ Stagnant model (D'Costa(2009), Parthasarathy(2005) *et al.*)

* **Strong *export* orientation** limits the capacity to upgrade
* Lack of vibrant **domestic demand** as a source of learning
* Lack of **local interaction** among firms→lack of interactive learning

■ End of the stagnant model? (Athreye(2005) *et al.*)

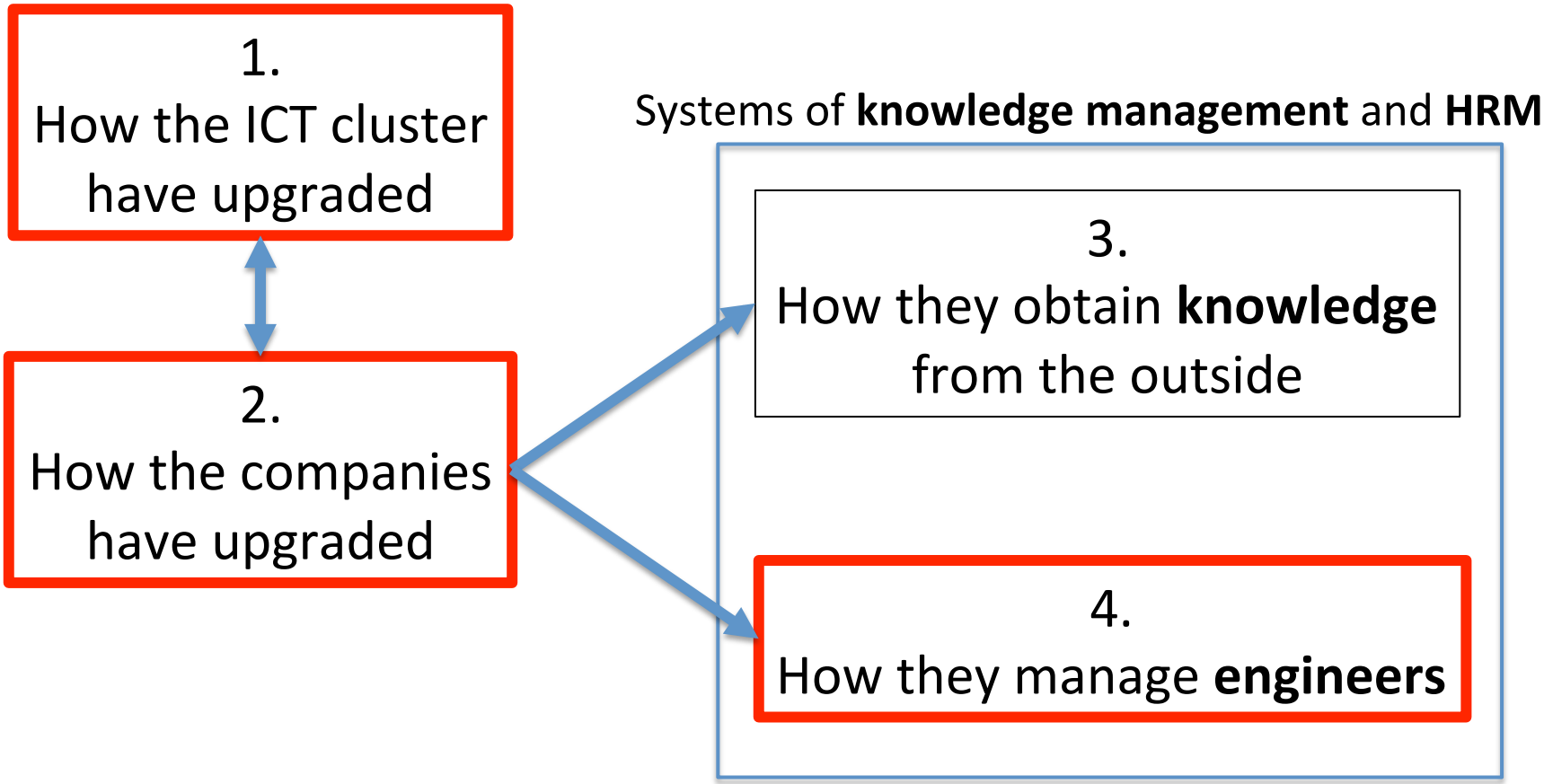
* Important changes: rising salary of engineers

→Becomes difficult to rely solely on the cost advantages

* Have to enhance the firm-specific organizational capability to differentiate
* But, no systemic evidence that support this argument.

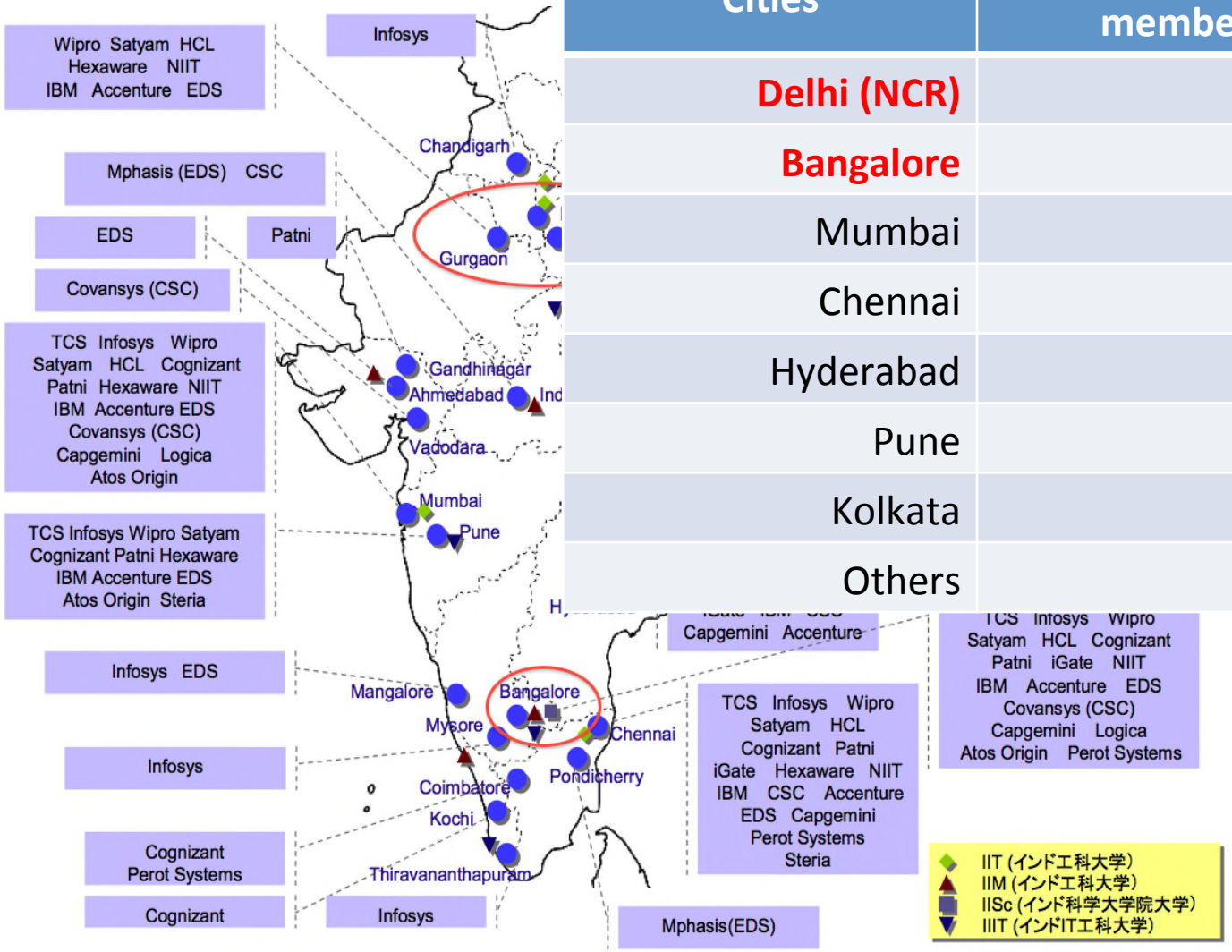
Objectives of this paper

Based on our original **questionnaire surveys**,
we examine the following issues and relationships.



% of NASSCOM member companies (2010)

Cities	% of NASSCOM members
Delhi (NCR)	22
Bangalore	21
Mumbai	15
Chennai	12
Hyderabad	9
Pune	6
Kolkata	3
Others	12



（Source: Mizuho Corporate Bank）

Summary statistics

- **Questionnaire survey** conducted in August-November, 2010.
- Firms located in **Bangalore** and **Delhi** (NCR)
- Sampling is from *All India IT Directory 2010*

	Bangalore		Delhi (NCR)	
	Observations	**Mean**	**Observations**	**Mean**
Age of the firms	99	10.4	100	10.2
No. of employees**	100	156.1	100	38.9
Sales（million Rs.）***	96	226.3	100	18.7
% of sales abroad***	100	33.1	100	6.2

(***/ **: Significance at 1%, 5%, respectively)

2. TRANSFORMATION OF THE ICT CLUSTER IN INDIA

2. Transformation of the ICT cluster

Composition of sales（%：S.D. in parentheses）

	Bangalore		NCR	
	2005	2009	2005	2009
Foreign firm in India	24.6 (17.8)	31.0 (16.7)	0	0.0
Foreign firm abroad	28.4 (32.9)	29.5 (31.3)	4.1 (7.0)	6.1 (9.1)
Indian firm in India	42.8 (31.7)	35.7 (25.9)	95.9 (7.0)	94.0 (9.1)
Indian firm abroad	2.3 (6.3)	1.6 (4.5)	0	0.0

- Sales to **the foreign multinationals locating in Bangalore** becomes important
- No evidence for heavy dependence on foreign market

2. Transformation of the ICT cluster

Requirement by customers (2005-2009)

※From 1 to 10

	Bangalore (N=100)		NCR (N=100)	
	Requirement	Change	Requirement	Change
Cost***	8.64	0.79	9.15	0.11
Quality*	9.75	0.35	9.59	0.00
Risk management***	6.10	0.39	3.45	−0.05
On time delivery***	9.50	0.08	6.71	0.02
Latest technology***	8.50	0.66	7.39	−0.13
Analysis and solution***	9.45	0.24	4.17	0.04

■ **Bangalore** firms face stronger requirements except in the “Cost”

■ **Bangalore** firms also face growing pressures from customers

→Especially from the foreign multinational customers

＝Emphasized in the interviews

2. Transformation of the ICT cluster

Advantages gained from their locations

■**Static advantage** gives firms short-lived competitive advantage.
(e.g., Access to the cheap labor and land)
■**Dynamic advantage** gives firms sustainable competitive advantage.
(e.g., Opportunity to learn and share information)

Static advantage	N	Mean***	S.D.	Min.	Max.
Bangalore	100	6.80	1.05	2.67	8.67
NCR	100	9.00	0.47	8.00	10.00

Dynamic advantage	N	Mean***	S.D.	Min.	Max.
Bangalore	100	7.59	0.56	6.60	8.80
NCR	100	2.89	1.81	1.00	6.80

Bangalore firms could gain **dynamic advantage** more than NCR firms.

3. EMPIRICAL ANALYSIS

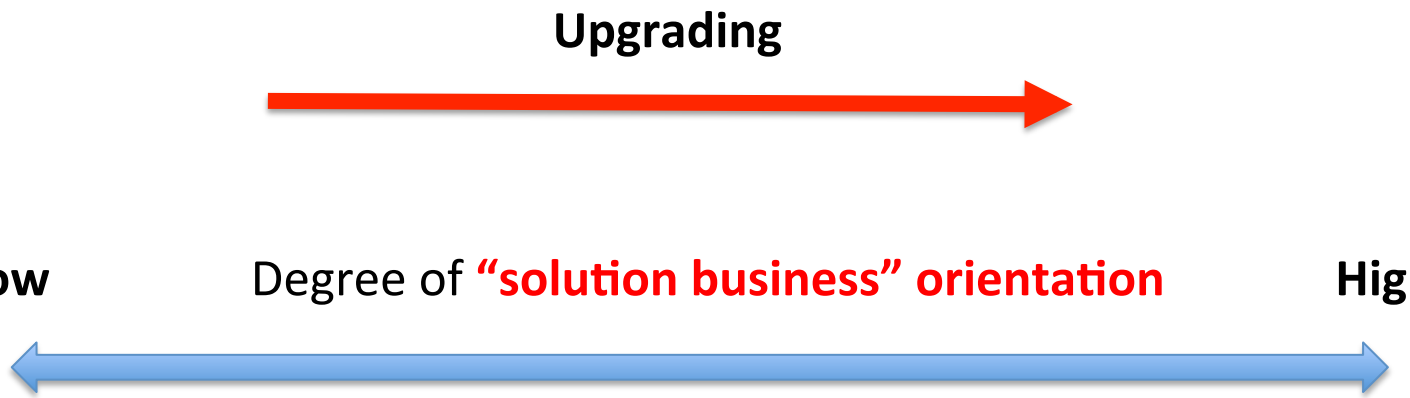
Summary statistics

- **Questionnaire survey** conducted in August-November, 2010.
- Firms located in **Bangalore** and **Delhi** (NCR)
- Sampling is from *All India IT Directory 2010*

	Bangalore		Delhi (NCR)	
	Observations	**Mean**	**Observations**	**Mean**
Age of the firms	99	10.4	100	10.2
No. of employees**	100	156.1	100	38.9
Sales（million Rs.）***	96	226.3	100	18.7
% of sales abroad***	100	33.1	100	6.2

(***/ **: Significance at 1%, 5%, respectively)

Framework



Simply following requirements

Satisfying the required QCD

Developing IT systems just by following the requirement by customers

【Competitive advantage】

【Example】

Providing extensive proposals

Differentiation
(QCD as a prerequisite)

Proposing requirements that customers do not recognize well, as well as developing IT systems

Nature of the business

Constructing synthetic variables(1): **Solution business orientation**

＊Asked to evaluate the relevant **factors of competitive advantage** (1-10)

- On time delivery
- **Differentiation in services**
- **Differentiation of business models**
- Low cost
- **Capability to analyze the customers problems**
- Quality
- Capability to manage projects
- **Sales and marketing**
- Managing risks

Average of the four =
Solution business orientation
(α=0.88)

	Mean***	S.D.	Min.	Max.
Bangalore	**7.9**	1.3	4.3	9.8
Delhi (NCR)	**1.9**	1.0	1	4.5

External information gathering

Constructing synthetic variables (2):

Emphasis on the external information

＊Asked to evaluate the **important sources of information for innovation**

- Own R&D
- Employees
- **Industry association**
- **Horizontal collaboration**
- **Trade fair**
- **New employees**
- **Seminars**
- Customers
- Suppliers
- **Universities**
- **Consultants**
- **Research institutes**
- **Rivals**
- **Licenses**
- **Magazines**

Average of the eleven=
Emphasis on the external information

(α=0.98)

	Mean***	S.D.	Min.	Max.
Bangalore	**6.9**	0.9	4.3	8.4
Delhi (NCR)	**1.2**	0.3	1	2.2

Management of technical talents (1)

※Importance of each training category (1-4)

■Solution business orientation × Training

	Intra-firm Off-JT	Extra-firm Off-JT	OJT
Weak	1.9	0.7	3.1
Modestly weak	2.5	1.0	2.6
Modestly strong	2.0	1.4	2.7
Strong	2.0	1.5	2.8
Correlation (ρ)	**0.04**	**0.24*** **	**-0.18*** **

■The more a firm is upgraded, the more **extra-firm Off-JT** it emphasizes.
■As far as the **intra-firm Off-JT** is concerned, all firms **equally** emphasize.
■**OJT** has a negative correlation.
→Influenced by the size of the firm?

Management of technical talents (2)

※Important factors of personnel evaluation (0-2)

■Solution business orientation × Important factors of personnel evaluation

	Target achievement	Commitment	Communication	Teamwork	Proactiveness
Weak	1.62	1.22	0.15	0	0
Modestly weak	1.13	1.31	0.31	0.19	0.06
Modestly strong	0.93	1.07	0.18	0.57	0.25
Strong	0.85	0.90	0.10	0.64	0.46
Correlation (ρ)	**-0.33*** **	**-0.14*** **	**-0.08**	**0.49*** **	**0.42*** **

Output-oriented factors of evaluation

Process-oriented factors of evaluation

Management of technical talents (3)

■Solution business orientation × mobility of engineers

	Solution business orientation			
	Weak	Modestly weak	Modestly strong	Strong
Attrition rate (%)	9.9	10.7	6.8	6.7
Years of experience	11.4	8.9	3.8	3.8

■The more a firm is upgraded, the **lower** the attrition rate is.
＝Because 1) easy to retain, and 2) need to train engineers internally

■Firms can upgrade even with **engineers who lack long experiences**.
＝Means that they do not need **knowledge obtained by experiences.**

4. DISCUSSION AND CONCLUSION

Discussion: (1) Clustering and upgrading

- **Upgraded demand by the foreign multinationals in India** is an important source of upgrading of local ICT firms. As the case of Bangalore shows.

- As upgraded firms in Bangalore demanded more external information, the city transformed itself to a cluster with **abundant opportunity of learning**.

- Interview revealed that MNEs outsource internal **ICT systems development** to local ICT SMEs more often than the case of the past.

Discussion: (2) Management of talents

■Upgraded firms have **internal, long-term oriented system of HRM** to develop, motivate and retain engineers to differentiate.
＝Training, long-term oriented evaluation and effective retention

■Interview revealed that firms try to make **tacit knowledge more explicit**.
That makes possible for them to **train engineers in short period of time by Off-JT**.

■Interview also revealed that firms do **not** necessarily demand **highly qualified, experienced technical talents**.
→Rather**, they do not often require prior experiences** because they can organize effective Off-JT course by themselves.

Concluding remarks

■It should be emphasized that they can establish the system of HRM (→2)) under the flexible labor market.

→Implies the high capability to organize knowledge as well.

■**High capacity to organize the ordinary level engineers** should be emphasized.

→**Organizational**, *not* **individual**, **capability** is high!

■Possibility to see novel organization for development to emerge?

→Remains to be seen.

Implications

- Local ICT SMEs can develop by responding to the **demand from the manufacturing sector**, as the Indian experience shows.

→Intra-firm ICT systems development is a typical example.

- Adapting to the **upgraded requirements by the foreign MNEs**, typically the manufacturing firms, is an important clue to the capability building at local ICT firms.

- However, it should be emphasized that **education policy** which tries to develop the highly qualified talents **is not the only way to upgrade**.

- It is important to invest in the **organizational capability** to manage the **ordinal level engineers** effectively.

Salamat!