

Nokia and the Evolution of Mobile Telephony*

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Global supply chains operate at ever-finer resolutions in terms of where & when individual tasks are carried out

*From the 1st to the **2nd unbundling***

(Richard Baldwin, 2006)

*From trading goods to **trading tasks***

(Grossman & Rossi-Hansberg, 2008)

Other:

*Disruptive Innovations and Competence
Destroying Tools*

(Tushman, M. L. & Anderson, P, 1986)

Global supply chains operate at ever-finer resolutions in terms of where & when individual tasks are carried out

Empirics:

What does the new mobile telephony global value chain look like?

What does the new geography of global value added look like?

How has the geography of global value add changed over time?

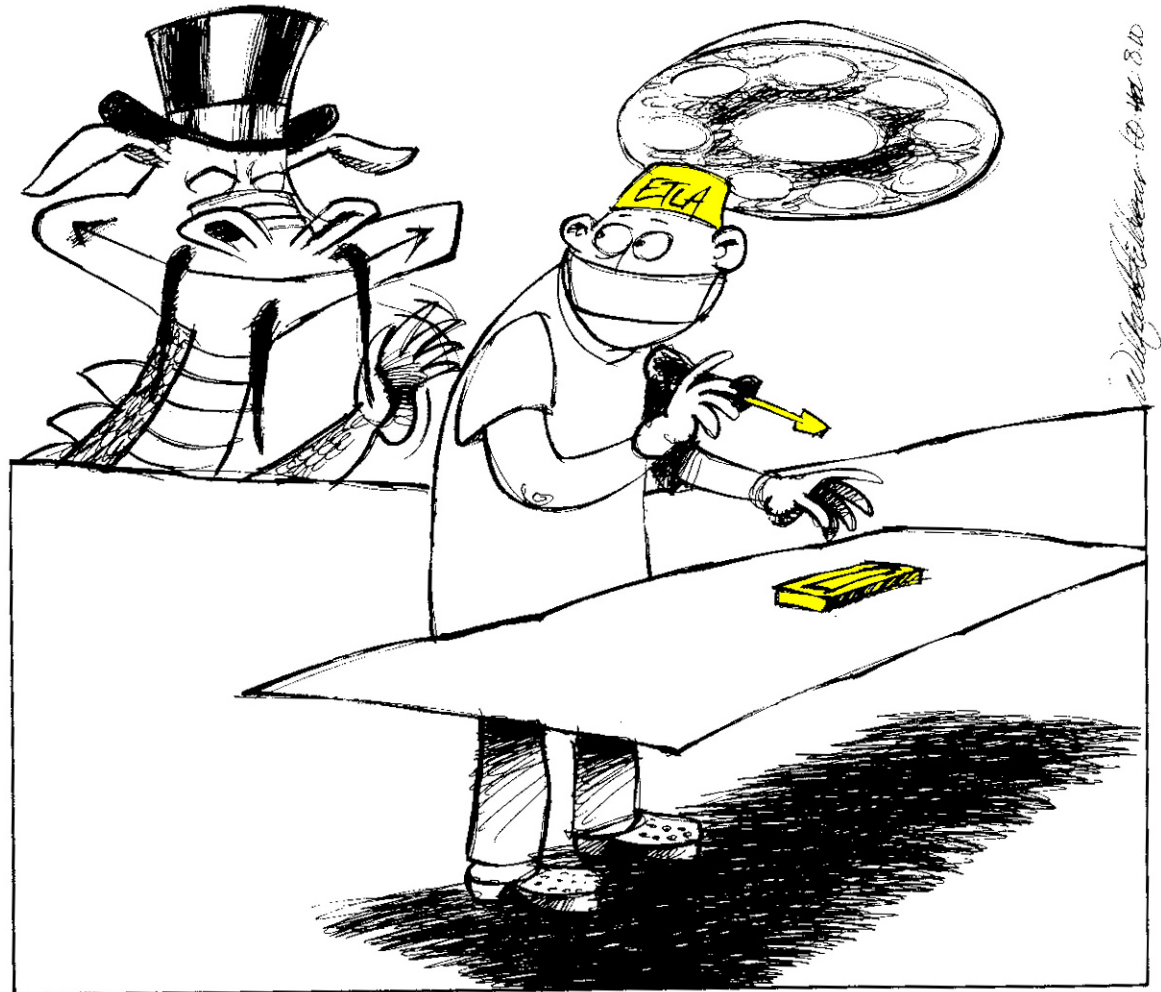
How has the geography of global value added tasks changed over time?

How has the patenting of a firm changed over time?

***Problem:** Value capture in global supply chains is **complex** and predicting **future value capture** is even more **complex**...*

Solution:
Screwdriver economics!

*Grass roots
detective work
in a specific cases*



Task 1/2

Mapping out value added by actors (firms/individuals), functions (R&D...) & geographies (locations/countries) in a case of one good (s).

Mapping out the whole global supply chain from raw materials / idea generation to a consumer's final purchase of a N95, 3310, 1100 and 1200 at a retail store

- All direct & indirect hard & soft inputs
- 1–8 stages before the final assembly & 2–4 after it
- For each, the loc. of innovation, direct labor & support (cap.)

E.g., N95's main processor by *Texas Instruments*

- Hardware design: Dallas (US) & Nice (France)
- Software design & integration to hardware: India
- Manufacturing: Dallas (US) & Japan
- Headquarters etc.

Task 2/2

Mapping out the geographical location of value added tasks

- All direct & indirect work inputs and its changes over time

E.g., 3310, 1100 and 1200 R&D, Industrialization, *Production*

- Hardware design: Denmark/Finland driven to Denmark/China driven
- Software design: Denmark
- Pilot production: Finland/USA driven to China driven
- Production: From advanced economies towards emerging economies

Mapping out the trends in patenting from OECD PATSTAT from 2000 until 2009

- All patents, all computing patents, all software patents, all telecom patents, all touch screen patents and

Approach

Our own examination of N95, 3310, 1100 and 1200 with electrical engineers

Public (Internet etc.) & private (industry contacts) sources to study value added of 600+ parts & software

Teardown report by Portelligent (and iSuppli)

OECD Patstat – Version April, 2011

In-depth interviews with industry actors/experts

Company reporting, industry press/services

Previous literature (by Linden & others)

A few researcher-years of work ...

Breakdown of the phone's €546 (+tax) retail price circa 2007

Refers to unbundled & unsubsidized official **retail price** w/o taxes. Excluding discounts & other possibly purchased products/services.

Licenses include protocols, the operating system, pre-installed software etc. Nokia is a major IPR holder in this domain & it does not pay fees to itself; thus value of its own IP is not included here. Furthermore, non-monetary payments (e.g., cross-licensing) is not included here. For a firm without own its IP, licensing fees could have be manifold.

As compared to some other studies, the cost of **final assembly** may seem high. Some other estimates, however, only include direct labor costs and refer to simpler goods.

Nokia's value added covers its innovation, advertising, design, marketing, financial, legal & management costs and depreciation & investment. It also includes some aspects of **outsourcing**, which we are unable to separate from Nokia's internal functions: purchases of "billable hours", some R&D and software sub-contracting, outbound logistics, and certain external warranty & other services.

Nokia's **profit** is assigned to Finland.

Based on publicly available information.

| |
|--|
| Processors , €34, 6% |
| Memories , €15, 3% |
| Integr.circuits , €32, 6% |
| Display , €22, 4% |
| Camera (5 mp), €17, 3% |
| Other parts , €59, 11% |
| Licenses , €21, 4% |
| Value added in Nokia's internal support fns , €169, 31% |
| (Excl. Operating profit & assembly listed below) |
| Nokia's operating profit , €89, 16% |
| Final assembly , €11, 2% |
| Distribution , €19, 4% |
| Retailing , €60, 11% |



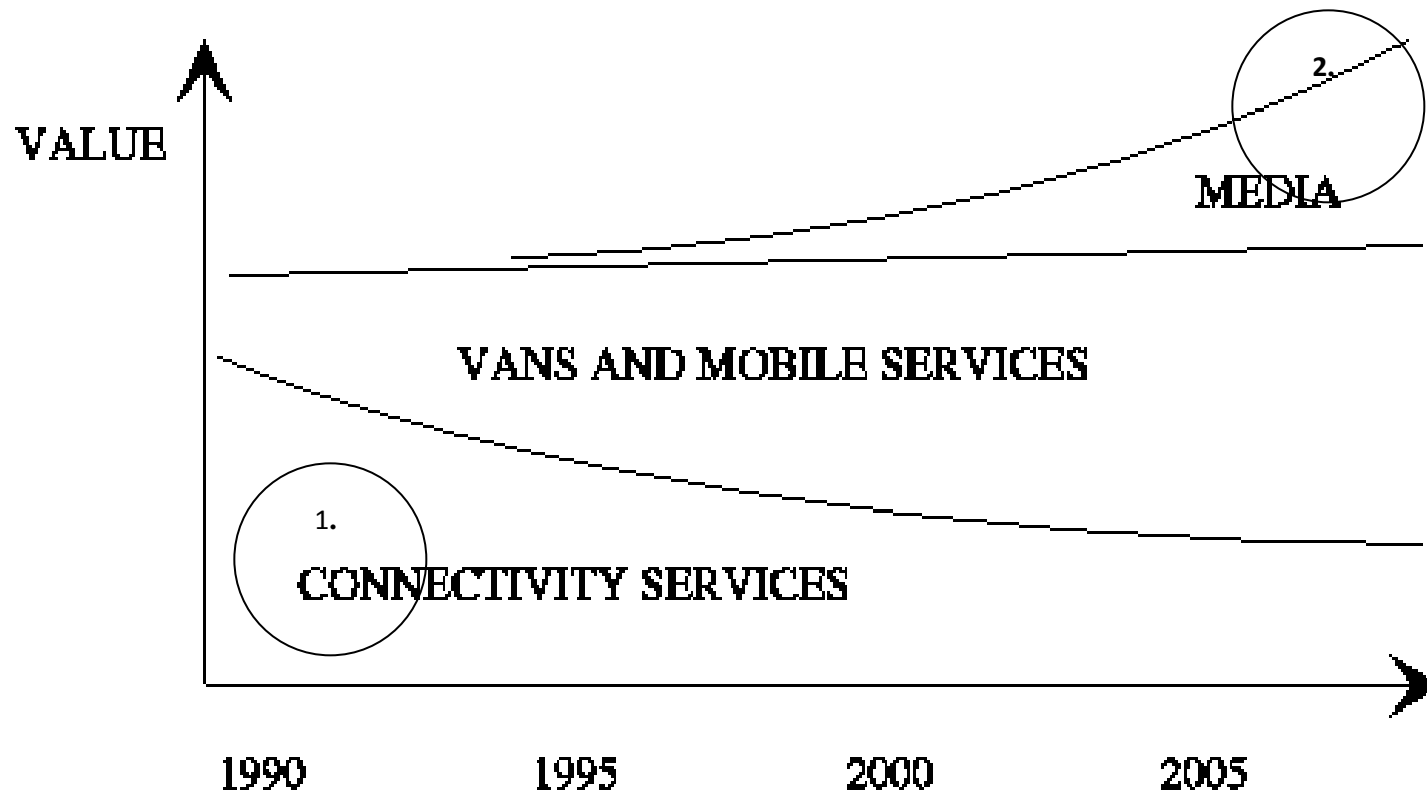
Breakdowns

Similar breakdown of the phone exist for 3310, 1100, 1200

| | N95 | Nokia 3310 | Nokia 1100 | Nokia 1200 |
|-----------------------------------|-------------|-------------------|-------------------|-------------------|
| Vendors of vendors | 19% | 22% | 21% | 34% |
| Suppliers of material inputs | 11% | 17% | 17% | 19% |
| Licensors | 3% | 0.5% | 0.5% | 0.8% |
| Engine manufacturing | | 5% | 3% | 2% |
| Nokia, excl. engine manufacturing | 50% | 38% | 39% | 19% |
| Logistics and warranty | | 2.5% | 4.9% | 6.4% |
| Distributor | 3% | 4% | 4.4% | 4.7% |
| Retailers | 11% | 10.6% | 10.2% | 13.6% |
| <u>Unaccountable inputs</u> | <u>3%</u> | <u>0%</u> | <u>0%</u> | <u>0%</u> |
| <u>Total</u> | <u>100%</u> | <u>100%</u> | <u>100%</u> | <u>100%</u> |

Source: Ali-Yrkkö & Seppälä, forthcoming 2011; ETLA database

Changes in Patenting focus of the Firm



Source: Seppälä & Martikainen, forthcoming 2011

By understanding how MNE's operate: What does the geography of global value added look like?

By understanding how Technology Life Cycles change MNE's behavior:

How has the geography of global value add changed over time?; How has the geography of global value added tasks changed over time?

By understanding how Patenting of new innovations develop:

How has the patenting focus of a firm changed over time?

We can answer the Question:

What does the new mobile telephony global value chain look like?

From Hardware and Software controlled value chain towards heuristics controlled value chain

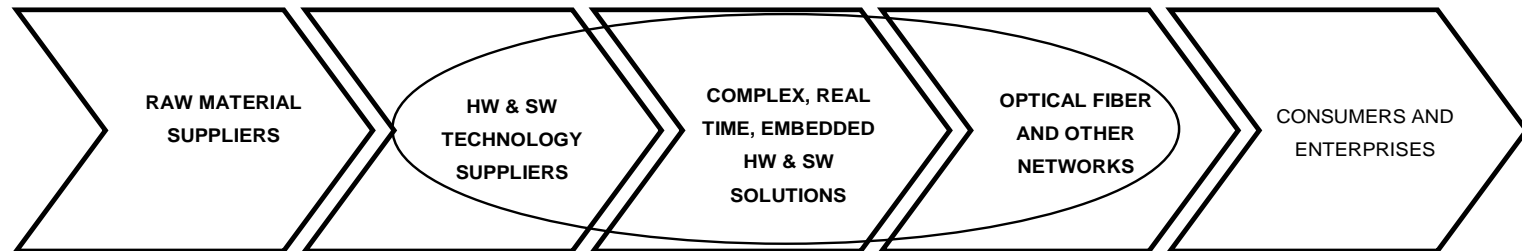


Figure 2: Hardware and software controlled global value chain

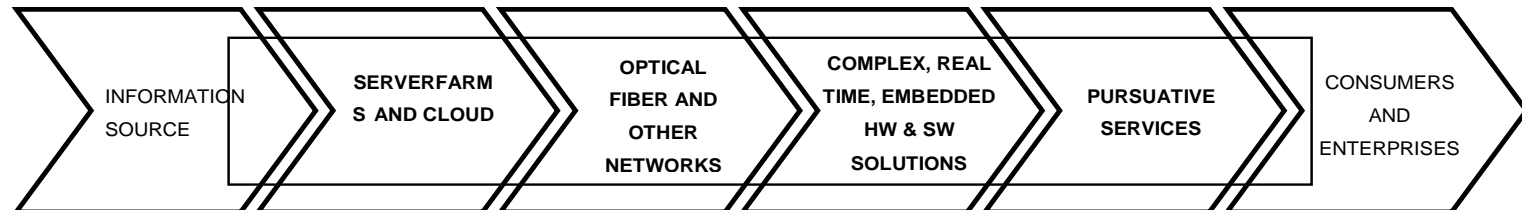


Figure 3: Heuristics controlled global value chain

Thank You!

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*Comments, remarks & discussion
are more than welcomed:*

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The method to divide value added to different regions

(1) $Y = \sum_{c=1}^N Y_c$ Y = Product's consumer price (pre-tax) which is the total value added of the product.
 Y_c = The value added of value chain's part (component or process) c .

The value added of each part Y_c can be created globally in different regions (D, E, N, A, O):

(2) $Y_c = Y_{c,D} + Y_{c,E} + Y_{c,N} + Y_{c,A} + Y_{c,O}$, where D = Domestic (Finland) N = North-America
 E = Europe (Other EU-15) A = Asia
 O = Others

To approximate the value of added of part c created in each region R , we use the following equation:

(3) $Y_{c,R} = \left(\frac{C_R}{C} \hat{\alpha} + \frac{L_R}{L} \hat{\beta} + \frac{K_R}{K} \gamma \right) Y_c$ C_R = firm's physical capital stock in region R ,
 C = the sum of firm's physical capital stock in all regions,
 L_R = firm's employment in region R ,
 L = firm's employment in all regions, $\hat{\alpha}$ = Output elasticity of capital
 K_R = firm's knowledge capital (R&D) in region R , $\hat{\beta}$ = Output elasticity of labour
 K = firm's knowledge capital (R&D) in all regions, γ = Output elasticity of R&D

To take into account the regional productivity differences, we calculate the productivity corrected value added of part c created in region R as follows

(4) $\hat{Y}_{c,R} = \frac{MFP_R \left(\frac{C_R}{C} \hat{\alpha} + \frac{L_R}{L} \hat{\beta} + \frac{K_R}{K} \gamma \right)}{\sum MFP_R \left(\frac{C_R}{C} \hat{\alpha} + \frac{L_R}{L} \hat{\beta} + \frac{K_R}{K} \gamma \right)} Y_c$, where MFP_c = multifactor productivity in region R .