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Incentives and Costs in Implementing Private-Collective Innovation: A Case Study

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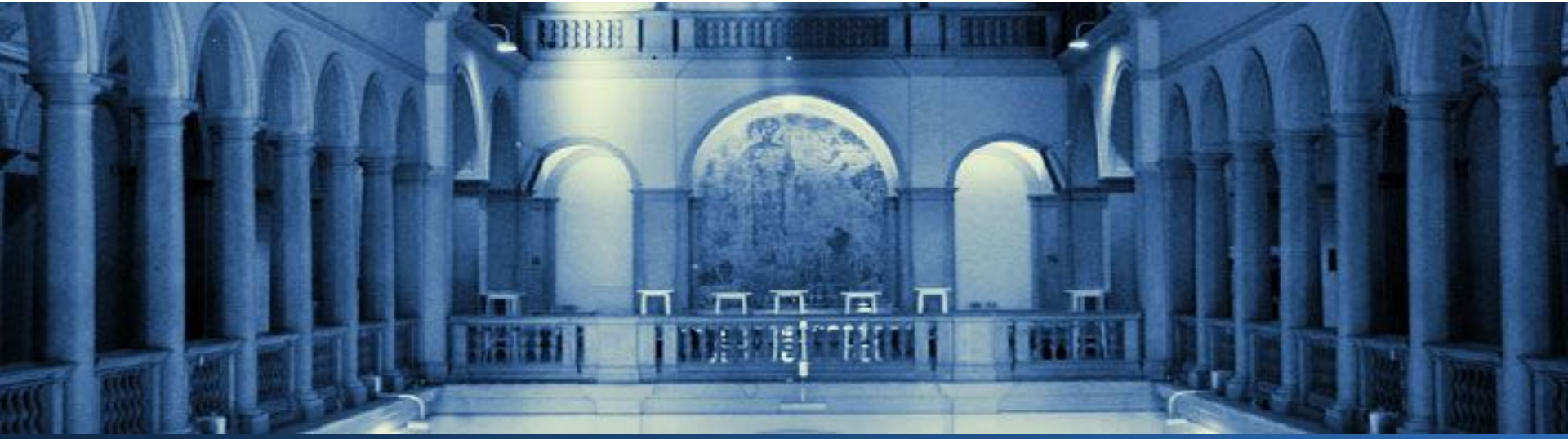


Apple iPhone

Nokia N810

FIC OpenMoko

low — **Degree of openness** — high

Overview

- Introduction → What is open source software?
- Theory → What is Private-Collective innovation?
- Method → Our research project
- Case → The Nokia Internet Tablet
- Findings → Incentives, costs & mitigation strategies

Briefly about Open Source Software

- Started 1984 by **Richard Stallman** founding FSF:
  - Freedom to run the program
  - Freedom to modify the program → source code access
  - Freedom to copy the program
  - Freedom to distribute modified versions of the program
- **Free Software vs. Open Source**
  - GNU General Public License (GPL): viral license
  - Open Source Initiative (OSI): accepts non-viral licenses
- Projects started by **individuals or firms**

Motivations of individuals to contribute to OSS

MOTIVATION	INTRINSIC				INTERNALIZED EXTRINSIC				EXTRINSIC	
	Ideology	*Altruism*	*Kinship*	*Fun*	*Reputation*	*Reciprocity*	*Learning*	*Own-use*	*Career*	*Pay*
Benkler 2002	—	—	—	S	—	—	—	—	—	S
Bergquist and Ljungberg 2001	—	—	—	—	—	S	—	—	—	—
Bitzer et al. 2007	—	T	—	—	—	—	—	T	—	—
David et al. 2003	T	—	—	—	—	T	T	T	—	—
Ghosh 2005	T	T	—	—	T	—	T	T	T	T
Hars and Ou 2002	—	T	T	—	T	—	T	T	T	—
Hemetsberger 2004	T	T	T	T	T	T	T	T	T	—
Hertel et al. 2003	T	—	T	T	T	—	—	T	T	T
Lakhani and von Hippel 2003	T	—	—	S	S	T	—	T	—	—
Lakhani and Wolf 2005	T	—	T	T	T	T	T	T	T	T
Lattemann and Stieglitz 2005	—	—	—	—	S	—	—	S	—	S
Lerner and Tirole 2002	—	—	—	—	S	—	—	—	S	—
Luthiger and Jungwirth 2007	—	—	—	T	—	—	—	—	—	T
Osterloh and Rota 2007	—	S	—	—	—	—	—	S	—	—
Haruvy et al. 2003	—	S	—	—	—	—	—	—	—	—
Roberts et al. 2006	—	—	—	T	T	—	T	T*−	T	T
Spaeth et al. 2008	—	—	—	—	T	—	T	—	—	—
Wu et al. 2007	—	T	—	—	—	—	T	T	T	—
Ye and Kishida 2003	—	—	—	—	—	—	S	—	—	—
Zeitlyn 2003	—	—	S	—	—	—	—	—	—	—

*−: significant negative impact on participation S: Suggested T: Tested

Haefliger, Wallin, Spaeth & von Krogh, working paper 2008

Case study on Nokia Internet Tablet

- **Authors:**
  Matthias Stuermer, Sebastian Spaeth, Georg von Krogh
- **Research question:** What are the incentives, costs and mitigation strategies for firms working with open source software?
- **Theory:** Extending incentives for Private-Collective Innovation with costs and respective mitigation strategies
- **Data:** 22 interviews with Nokia managers and developers, contractors and community members; 25 hours interview; ~250 pages of transcripts
- **Method:** Inductive research; open coding with MAX.QDA; >1000 codings in 80 categories; merged to 12 categories

Theory

Three Innovation Models

1. **Private investment model**
   - Appropriation of financial returns from innovations through IPRs → patents, copyright, licenses, trade secrets
   - Knowledge spillover reduces innovator's benefits
2. **Collective innovation model**
   - Investments in public goods → non-rival, non-excludable
   - Free riding problem → public funding, governments
3. **Private-collective model of innovation**
   - Innovators privately fund creation of public goods
   - Example: production of open source software by firms

Private-Collective Model of Innovation

- **Free knowledge sharing**
- **Explains conditions** when innovators receive rewards from private investments in public good innovations
- Rewards from **process of innovation** surpasses rewards of free-riders → involvement in innovation process
- Process-related **rewards** > process-related **costs** → public good innovation
- **What are such rewards or incentives?**

von Hippel & von Krogh, 2003; von Krogh & von Hippel, 2006

Incentives for Private-Collective Innovation

- **6 incentives for PCI** *(von Hippel & von Krogh, 2006)*
  1. No cost of **controlling** knowledge *(Foray, 2004; Alavi & Leidner, 1999)*
  2. **Learning** benefits *(Allen, 1983; Nuvolari, 2004; Baldwin & Clark, 2006)*
  3. **Reputation** gain *(Allen, 1983; Lerner & Tirole, 2002)*
  4. Fast and widespread **diffusion** of innovations *(Economides, 1996)*
  5. Lower costs of **innovation** *(Chesbrough, 2003; Haefliger et al. 2008)*
  6. Lower costs of **manufacturing** *(Kotha, 1995; Harhoff et al. 2003)*
- Literature gap: **"Hidden costs" in implementing PCI**

Methodology

Research Design

6 Incentives for Private-Collective innovation

deductively testing

Extended model of Privat-Collective innovation

New incentive:
7. Faster time to market

Costs:
1. Difficulty to differentiate
2. Guarding business secrets
3. Reducing network entry barriers
4. Giving up control
5. Organizational inertia

Mitigation strategies

inductive findings

Nokia Internet Tablet case study

22 Conducted Interviews

	Stakeholder	Date			Duration	Contribution, Function
N1	**Nokia**	Nov	15	2006	89 min	Head Open Source Software Operations at Nokia
C1	**Contractor**	Nov	22	2006	71 min	Developed Window Manager
V1	**Volunteer**	Dec	6	2006	55 min	Linux Distribution Release Manager
V2	**Volunteer**	Dec	7	2006	52 min	Developed Mapping Software
V3	**Volunteer**	Dec	13	2006	54 min	Developed Music Player
C2	**Contractor**	Dec	14	2006	89 min	Performance Measurements and more
V4	**Volunteer**	Dec	15	2006	79 min	Developed Virtual Memory Feature
N2	**Nokia**	Dec	15	2006	58 min	Maemo Product Manager
N3	**Nokia**	Jan	12	2007	92 min	Software Architecture Team Leader at Nokia
N4	**Nokia**	Feb	19	2007	83 min	GNOME Desktop Developer at Nokia
V5	**Volunteer**	Feb	20	2007	85 min	Ported Remote Control Software
N5	**Nokia**	Feb	20	2007	96 min	GNOME Desktop Developer for Nokia
N6	**Nokia**	Feb	28	2007	80 min	Multimedia Player Developer for Nokia
C3	**Contractor**	Mar	5	2007	81 min	GNOME C++ Bindings Developer
C4	**Contractor**	Mar	13	2007	email	Software Developer at Contracted Firm
N7	**Nokia**	Mar	21	2007	60 min	GNOME Desktop Developer for Nokia
V6	**Volunteer**	Apr	4	2007	71 min	Developed Geolocation Software
C5	**Contractor**	Apr	10	2007	email	CEO of Contracted Software Company
N8	**Nokia**	Apr	11	2007	69 min	X Windows Developer for Nokia
N9	**Nokia**	Apr	12	2007	77 min	Maemo Community Manager
N10	**Nokia**	Apr	12	2007	91 min	Testing Team at Nokia, Volunteer in Browser Project
V7	**Volunteer**	Apr	23	2007	66 min	GNOME Foundation Board Member
22					25 hours	

Uniqueness of the case (the talking pig*)

1. **Target Group:** New product category
2. **Hardware:** first non-GSM end user device
3. **Software:** first Linux end user device

Nokia

4. **Approach:** Revealing of substantial knowledge
5. **Strategy:** Integration in established open source communities, creation of own community
6. **Partnerships:** Individuals and small software firms

Mobile device industry

*: Nicolay Siggelkow 2007 “Persuasion with Case Studie” AMJ Vol. 50, No. 1

Evidences of Innovation Success (dependent variable)

1. **Product decision** in 2003 for Nokia 770
2. Development of **successor devices** N800 and N810
3. Inclusion into **N series**, Nokia's multimedia device platform (high visibility because of high marketing budget)
4. **Launch of N800 by CEO** himself at CES 2007
5. **Community** size, contributed applications, bug fixes...

Business success (sales figures, number of staff, future investments...) depends largely on marketing effort.

Case

Nokia N810

Hardware

- 800x480 Touch Screen, WLAN & Bluetooth
- 128MB RAM, 2 SD Flash Memory Slots
- 330 Mhz Texas Instruments OMAP Processor
- 640x480 video camera, weight: 200g

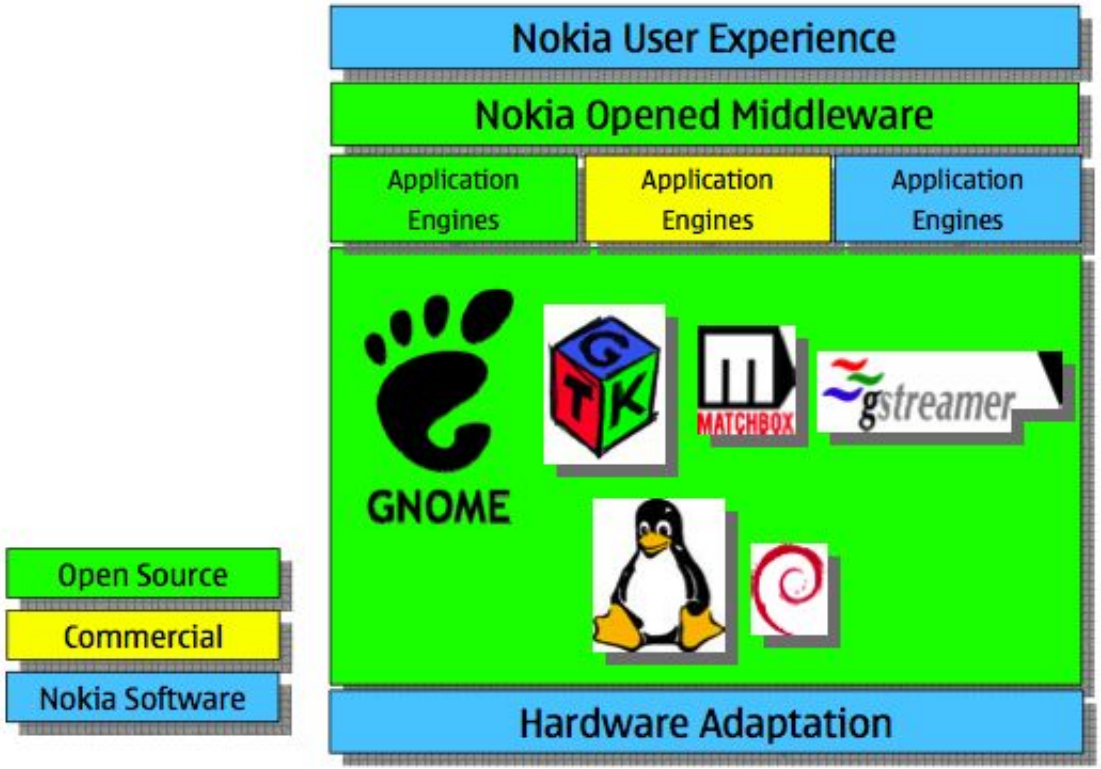
Infrastructure

- Customized Debian GNU/Linux
- X Windows, GTK, GStreamer, D-BUS

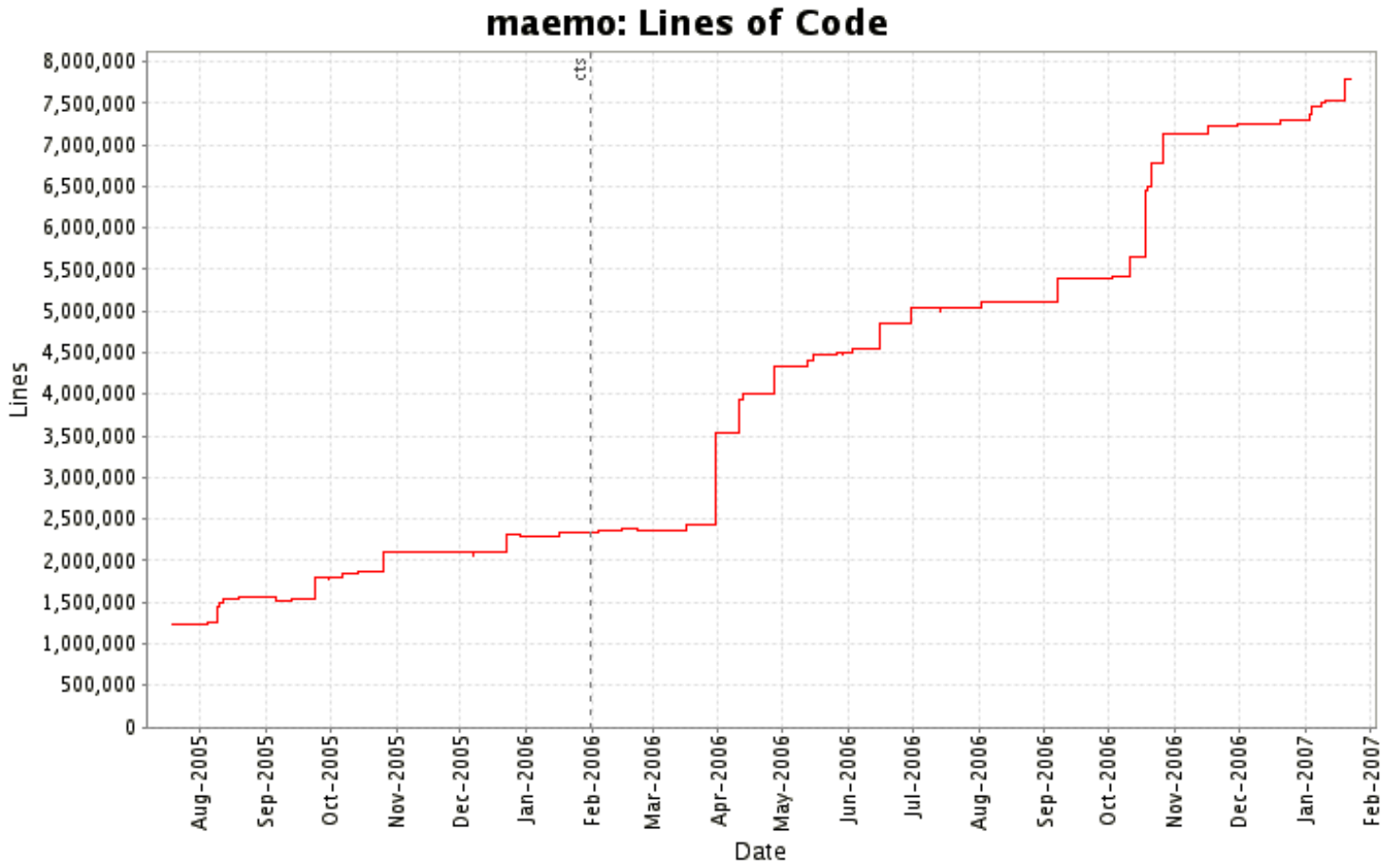
Applications

- Open: VNC Viewer, MaemoMapper, Ogg Player...
- Proprietary: Opera, Canola, Google Talk...

The Hybrid Software Stack



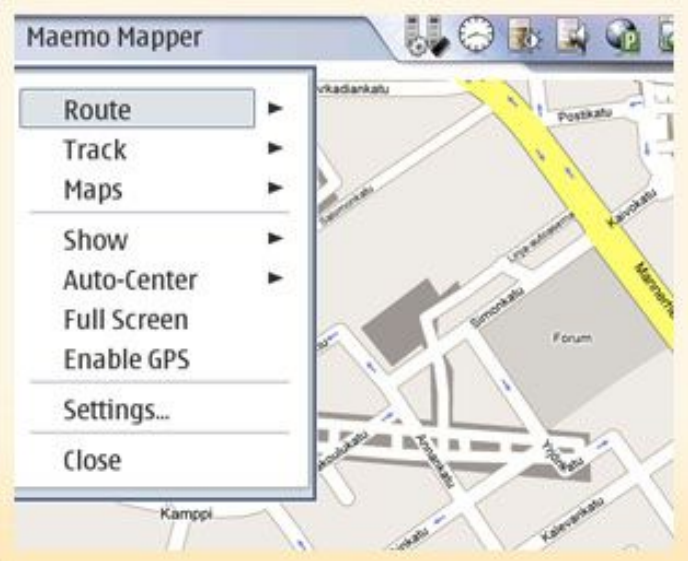
Source Code Analysis (Subversion Repository)



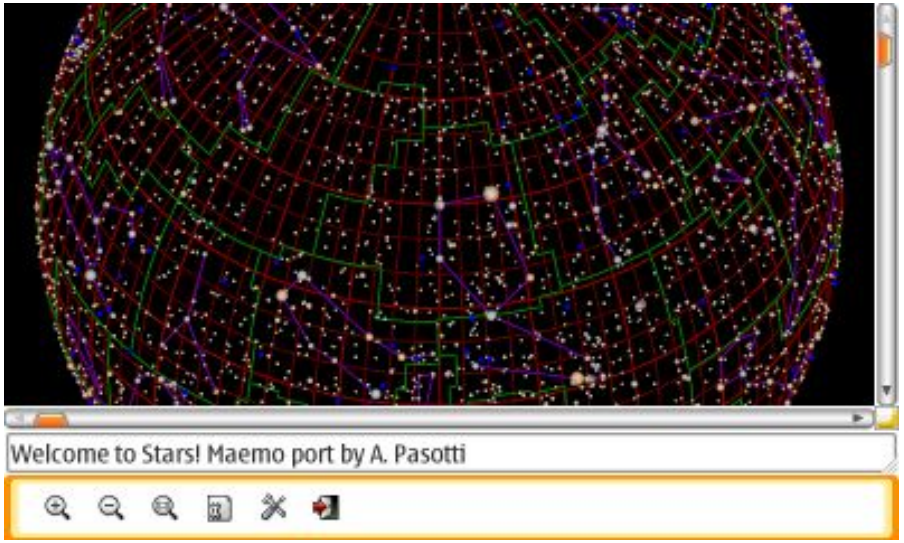
Community contributions

Hundreds of applications on maemo.org for Nokia Internet Tablets, e.g.

Maemo-Mapper



Maemo-Stars



Community Building by Nokia

- Sale of **1500 discounted Tablets** to active OSS developers
- **maemo.org** for tutorials, road map, API docs, Wiki, Blog Planet...
- 244 registred **Maemo projects** on garage.maemo.org [2007-06-30]
- **Mailing Lists** (June 2005 - December 2006) and IRC chat
  - Developer: 6795 mails from 832 email addresses (79 Nokia)
  - User: 2534 mails from 511 email addresses (33 von Nokia)
- Bugzilla for **bug reporting**: about 1000 reported issues
- Maemo **software development kit (SDK)**
- **Sardine:** development (unstable) version of the operating system

Contractors of Nokia

Company	Expertise	Country
KernelConcepts	GPE and Embedded Linux	Germany
OpenedHand	Matchbox	United Kingdom
Collabora	Telepathy	United Kingdom
Imendio	GNOME and D-BUS	Sweden
Fluendo	GStreamer	Spain
Movial	Scratchbox	Finland

Total contracts with over 20 different (mostly small) software firms

Results

Incentives and their findings in the case

Incentive	*Findings in the Nokia case*
Low knowledge protection costs	Revealing of source code, no protection required
Learning effects	Collaboration with external firms and individuals
Reputation gain	Increased attraction of Nokia as employer and for building an own developer community
Adoption of innovation	Standard setting of the platform configuration
Lower costs of innovation	Reuse of open source software, outsourcing of software testing and bug fixing, and maintenance to open source communities
Lower manufacturing costs	No licensing fees for software platform
NEW: Faster time to market	Tapping of distributed technology expertise and high flexibility of software platform

Costs and possible mitigation strategies

Cost	*Findings in the Nokia case*	*Mitigation strategy*
Difficulty to differentiate	Released source code can be reused by competitors	Partial revealing of source code to retain control of hardware integration and look and feel
Guarding business secrets	Plans for new products	Selective revealing of future plans and protection of information through NDAs
Reducing network entry barriers	Investments for Software Development Kit, preview version of platform, device program, staff for community management, and increased communication effort	Sharing the costs with other actors in the network.
Giving up control	Development direction such as scope of functionality of open source projects are controlled by external parties	Hiring of key developers and participation in upstream communities. No single vendor controls platform.
Organizational inertia	Required internal restructuring of processes	Adapt and open up processes.

Future research

- **Understanding Private-Collective innovation**
  - Motives of entrepreneurs: early private investments
  - Fragility of knowledge sharing: role of viral GPL
    → Gaechter, von Krogh & Haefliger, working paper
  - Leadership and governance
- **PCI in other industries and fields**
  - Biotechnology, 'Science Commons'
  - Cultural goods

Ari Jaaksi, Head of OSS Operations Nokia

But we believe the world is changing and the competitive advantage comes from how many others can you get from participating in this network. This network becomes more important than trade secrets.

Questions, comments?

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