

# Knowledge Management: New ways to Integrate Technology in Organizations

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# Outline

- ICT and learning at work research group
- Knowledge management
- Challenges facing KM
  - Integration with user communities
- Addressing the challenges
  - Motivating examples
  - InterMedia projects
- Directions for further research
  - Implications for theory, methodology and technology





# ICT & Learning @ Work

- The InterMedia research cluster *ICT and Learning at Work* do research on
  - Blended learning and long-distance leadership
  - Developing conceptual models of learning at work
  - Organizational user interfaces to support workplace learning
  - Techniques for studying and intervening practice
  - User-initiated product development
- We have background in CSCW, Education, HCI, Health informatics, Information systems





# Perspective

- Knowledge management is in this talk seen from perspectives of HCI, CSCW, and CSCCL
- The focus is on knowledge creation initiated by end users (e.g. customers)
- In the KP-Lab EU project we study the initiation and transformation of knowledge within and across organizations
- Supporting end-user development, communication and information sharing with new (ICT) technology





# Knowledge in KM

- How knowledge is dealt with in companies is different from how it is treated in education
- It is constrained by practical concerns such as business processes and business goals
- In the KM literature the focus is on knowledge of *processes, products and services*
- KM is not unrelated to education, for instance there is overlap with situated learning (Lave & Wenger, 1991) and cognitive apprenticeship (Collins, 2005)





# Knowledge management (very brief) overview

- Developing models of knowledge development processes and tool support
- Key activities and stages in generalized model
  - *Creation*
    - Proposing new knowledge specific to a new situation, tool, process or concept, of relevance to a company
  - *Organization*
    - integrating new knowledge into a “repository,” making it meaningful/useful to others in the company
  - *Distribution*
    - Spreading knowledge to a larger community within the company and its partner organizations





# Related models proposed in KM and elsewhere

- *Knowledge building* in CSCCL (Bereiter & Scardamalia, 2006)
- *Knowledge development cycle* (Bhatt, 2000)
- *Knowledge integration in flexible organizations* (Björkegren & Rapp, 1999)
- *Four modes of the organizational knowledge creating process* (Nonaka & Takeuchi (1995)
- *Initiation-revision-evaluation phases with design tools in HCI* (Shneiderman, 2000)





# Knowledge development cycle

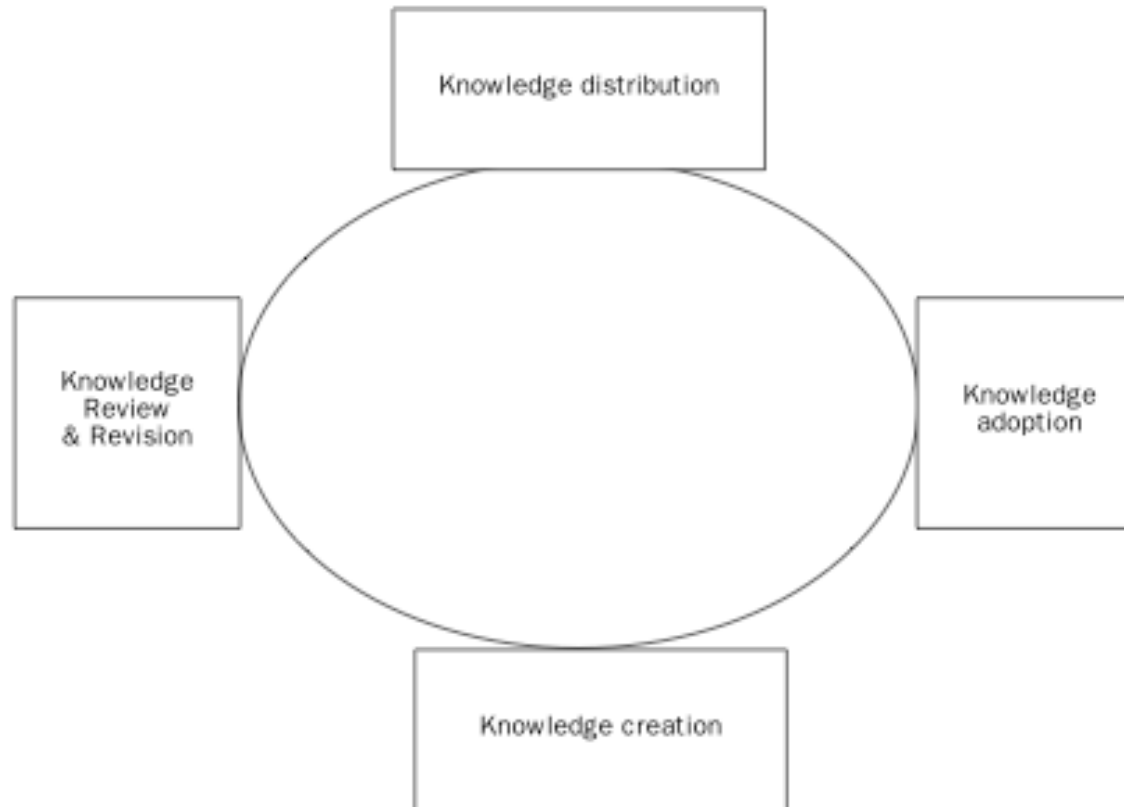
Organizing knowledge in the knowledge development cycle

Ganesh D. Bhatt

Journal of Knowledge Management

Volume 4 · Number 1 · 2000 · 15–26

Figure 1 Organizational knowledge development cycle







# Knowledge creation (Bhatt, 2000, p. 19)

- “Knowledge creation (KC) is not a systematic process that can be planned and controlled, the process is continually evolving and emergent”
- “The KC process is evaluated based on originality and adaptive flexibility to facilitate the solution of a problem in different contexts”
- “Knowledge creation in the organization is led by individuals, i.e. an organization creates knowledge through its individuals.”





# Boundary crossing challenge

- Knowledge management studies tend to view knowledge creation as confined to individuals and/or taking place within one organization
- This maintains a producer and consumer dichotomy inherited from *industrial information economy* (e.g. Benkler, 2006; Bereiter, 2006; Fischer, 2002)
- *Knowledge-intensive companies* are increasingly dependent on knowledge creation taking place *outside* established boundaries
- This is a challenge for the KM studies surveyed



# What boundaries to transcend?

- Organizational boundaries
  - Developer-customer
  - Producer-supplier
- Professional boundaries
  - In a knowledge based society knowledge is needed because complexity is high, and multiple voices need to assemble for this to be possible
    - Multi-perspective reflection
    - Joint development of common artifacts
- ...





# Two motivating examples

- 1) User-driven innovation in recreational bicycle manufacturing
  - User participation led to new bike series
- 2) Lego-user integrated design environment
  - Web 2.0 technology employed in a commercial organization (“Enterprise 2.0”)

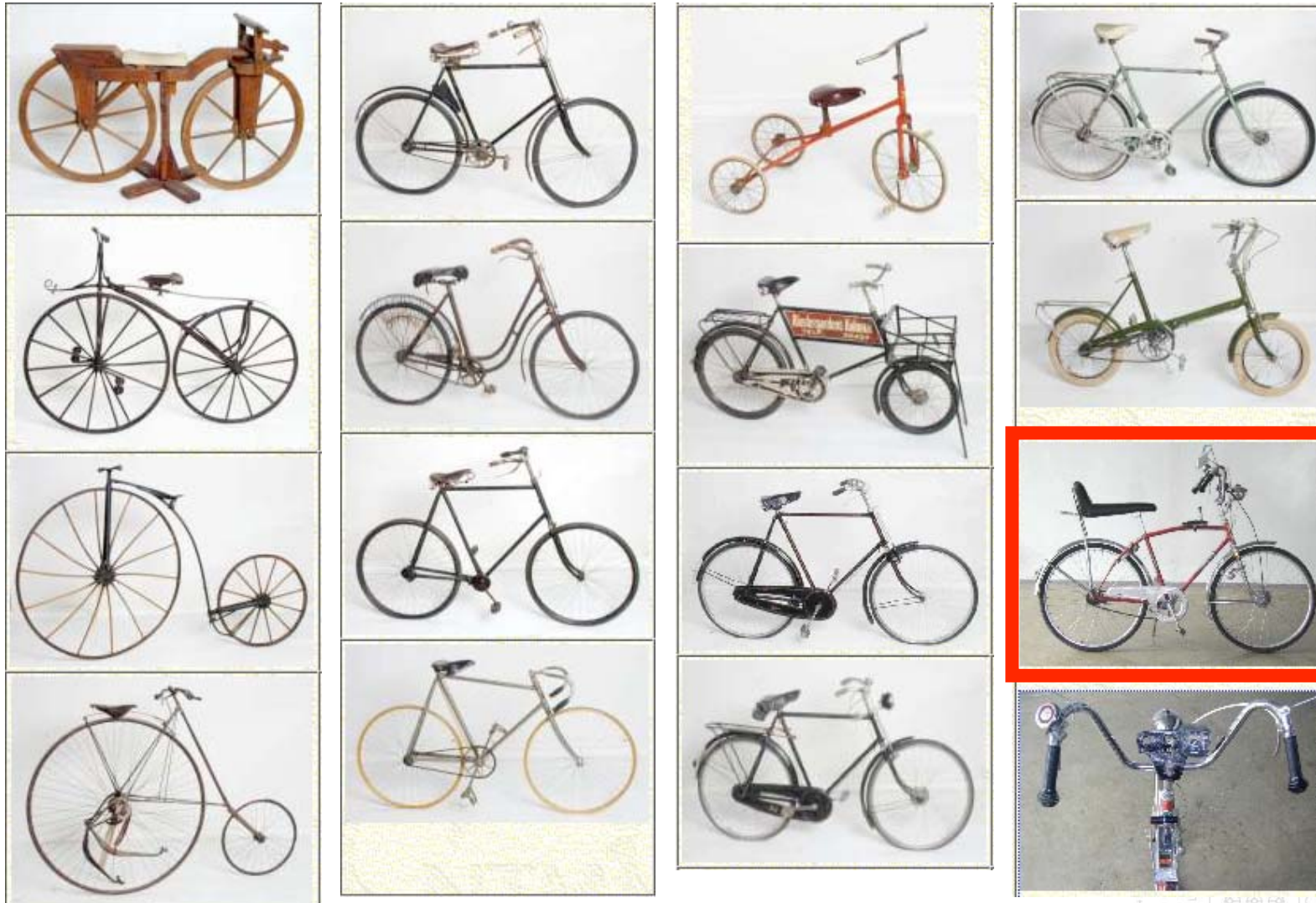


# Key model of bicycles 1820-1970

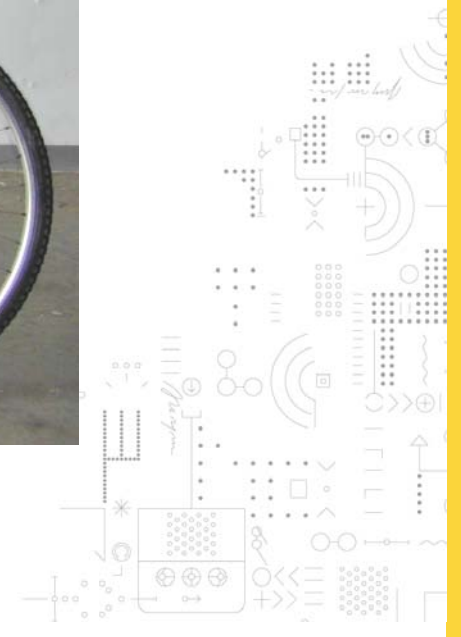


**Notice radical innovation in some of the models!**

# Key model of bicycles 1820-1970



# Motocross era (Apache, 1970)





# The inspiration for this design came from outside bicycle manufacturing

- “[Easy rider](#)” movie (1969) and “[Motocross](#)” U.S. TV programs and commercials







# User adoption of motorcycle features into bicycles and biking practices (on-road → off-road)

- TV broadcast in US, “On any Sunday,”  
[Youthprogram](#)





# What the example shows

- Boundary crossing between user and professional communities
  - Developer community (bike manufacturer)
  - User community (youths, 8-14 years old)
  - Other professional communities (motor bikers, motocross, and movie stars)





# Lego-user integrated design environment

- LUGNET: LEGO Users Group Network
- Communication and information sharing site (Web 2.0)
- Integrated with the play and practice of creating Lego buildings





# Lego user group community portal

**Forums** **Spotlight** **Guide** **Members** **Events** **Links** **Help**

Search LUGNET  
Forums GO  
[Advanced Options](#)

**Welcome to LUGNET** - International LEGO Users Group Network, global community of LEGO enthusiasts. LUGNET unites LEGO fans worldwide through forums, web pages, and services.

**Top Stories**

- [Yankee Stadium - really darn big](#)
- [Chemical Tanker Cars - Rolling Stock](#)
- [Four new MINI models from the Star Trek and Battlestar Galactica Universe](#)
- [Dark Side of the Moonbase](#)
- [50th anniversary of the Smurfs](#)
- [Draft at BrickCon 2008](#)
- [Druglords just can't Lego](#)
- [New parts available on PAB online and Factory Palette](#)

[More Top Stories](#) as highlighted by LUGNET Members

**Video: Happy Birthday LEGO Brick!**  
(28 Jan 2008) Due to the 50th anniversary of the LEGO brick, LEGO gave us access to this video. You may download it, but please use it for non-commercial purposes ONLY. [Download \(15MB\)...](#)

**50th Anniversary of the LEGO Brick**  
(28 Jan 2008) Today the classic LEGO Brick celebrates its 50th Anniversary. LUGNET sends its congratulations on behalf of all LEGO Fans and wishes LEGO a never ending supply of the famous granulates, so that billions of elements can be produced! We look forward to this, as this will continue to enable kids and AFOLS to utilise the elements in the hobby and play rooms across the world. Because, in our humble opinion - LEGO is the most creative toy of all times!

**Latest MOC**  
**Chemical Tanker Cars - Rolling Stock**  
by Dave Sterling

[Click to enlarge](#)

**LUGMap**  
Find a LEGO Users Group or Train Club in your area.

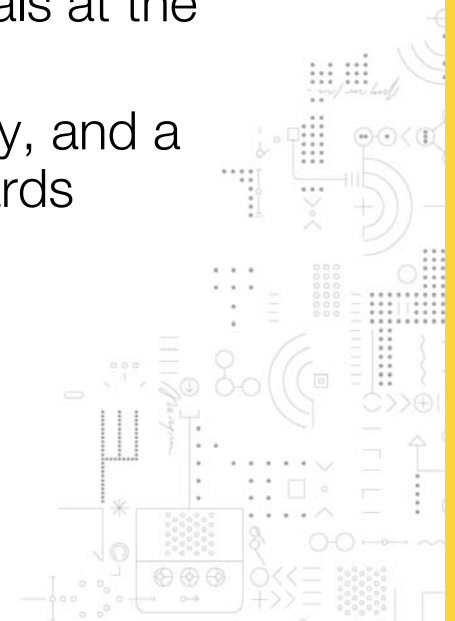
[Click to enlarge](#)

**Helpful Links**  
**Instruction Scans?**



# What the example shows

- Integrated design environment
  - Users can act as designers when supported with the right tools
  - Communicating ideas for new products and exemplary artifacts to fellow Lego users and to professionals at the company (product line developers)
  - High level of engagement in the user community, and a willingness to participate without monetary awards





# Examples from InterMedia projects

- KP-Lab
  - Knowledge creation and transformation
    - Education and workplaces
- KIKK
  - Customer-initiated product development in software industry





# Knowledge-Practice Laboratory (KP-Lab)

- Large EU-funded IP with 22 partners from 14 countries
- Technology development of a shared learning environment for education and workplaces
- Developing tools for creation and modification of knowledge artifacts and practice change
- Collaborative design of pedagogical models for scenarios in education and workplaces
- InterMedia is WP leader for “knowledge practices in workplaces”

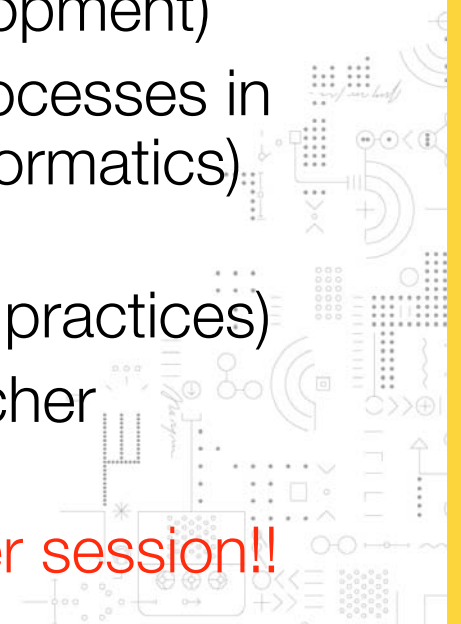




# Knowledge practices in workplaces

- InterMedia do research in several cases:
  - *ChronICT* (use of Web 2.0 for health care support)
  - *DiCAP* Ullern (school leadership practices)
  - *KIKK* (customer-initiated product development)
  - Knowledge creation and production processes in *transforming social practices* (health informatics)
  - Multidisciplinary knowledge practice in *nanotechnology* (laboratory knowledge practices)
  - *PlictE* (Use of WIKI tool for student-teacher collaborative knowledge development)

More about these and other cases in poster session!!

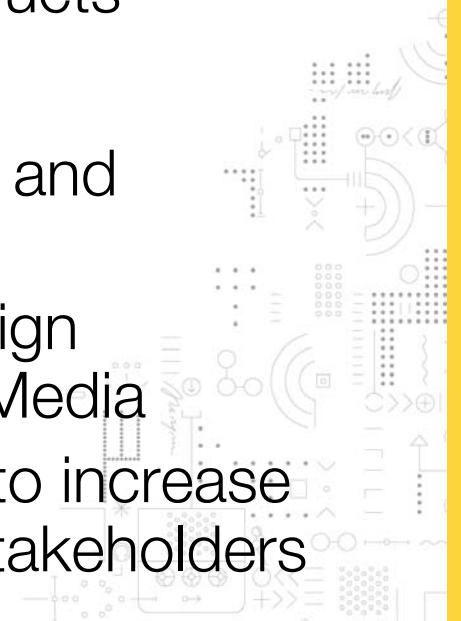






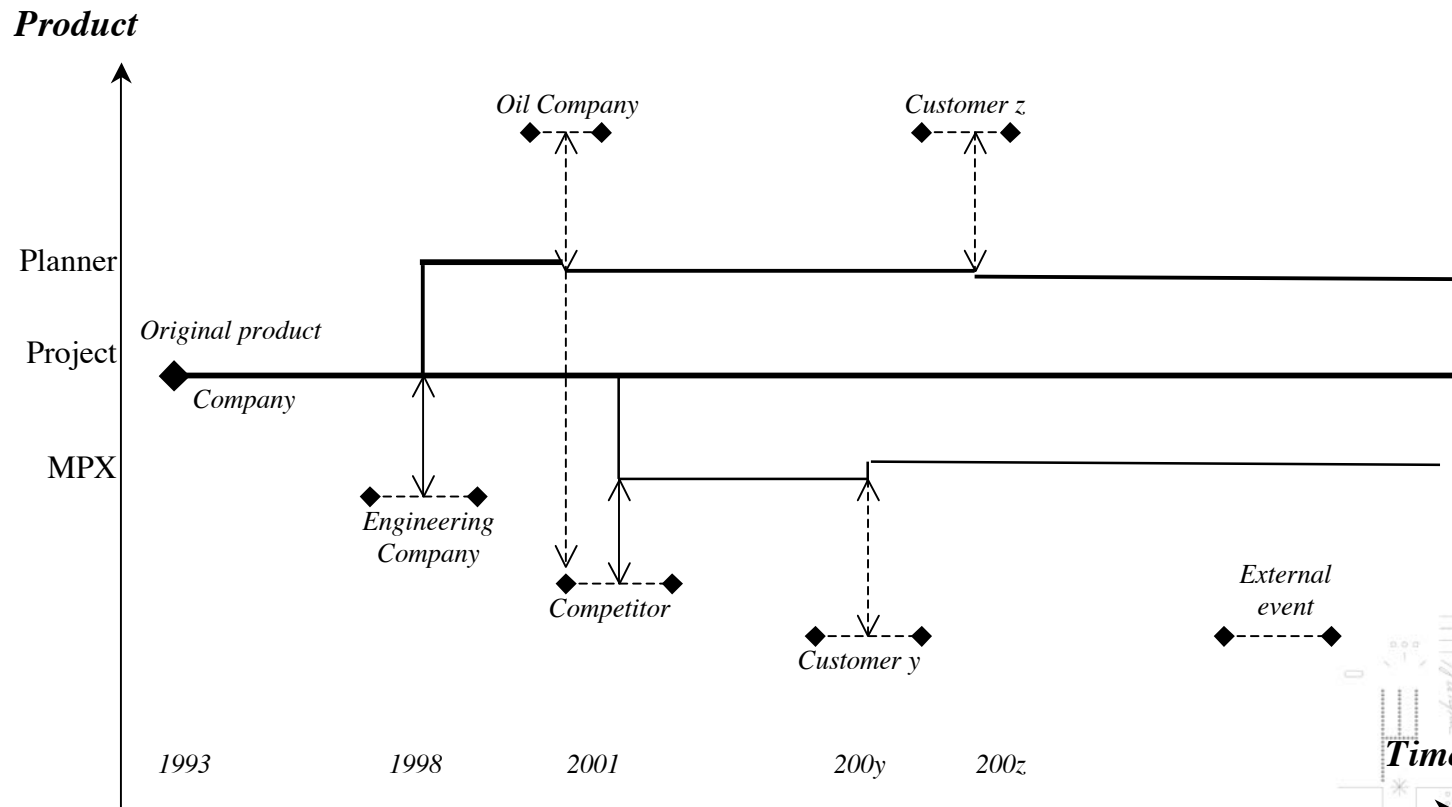
# Customer-initiated product development in KIKK

- Case
  - Company is a producer of project planning tools for the oil & gas and building industry in Norway
  - Relies on customers for improving products
- Methods
  - Interviews with developers, consultants and customers
  - Focus groups at company site and design workshop and status meetings at InterMedia
  - We developed a Web portal prototype to increase information sharing between different stakeholders





# Software product line evolution triggered by external events



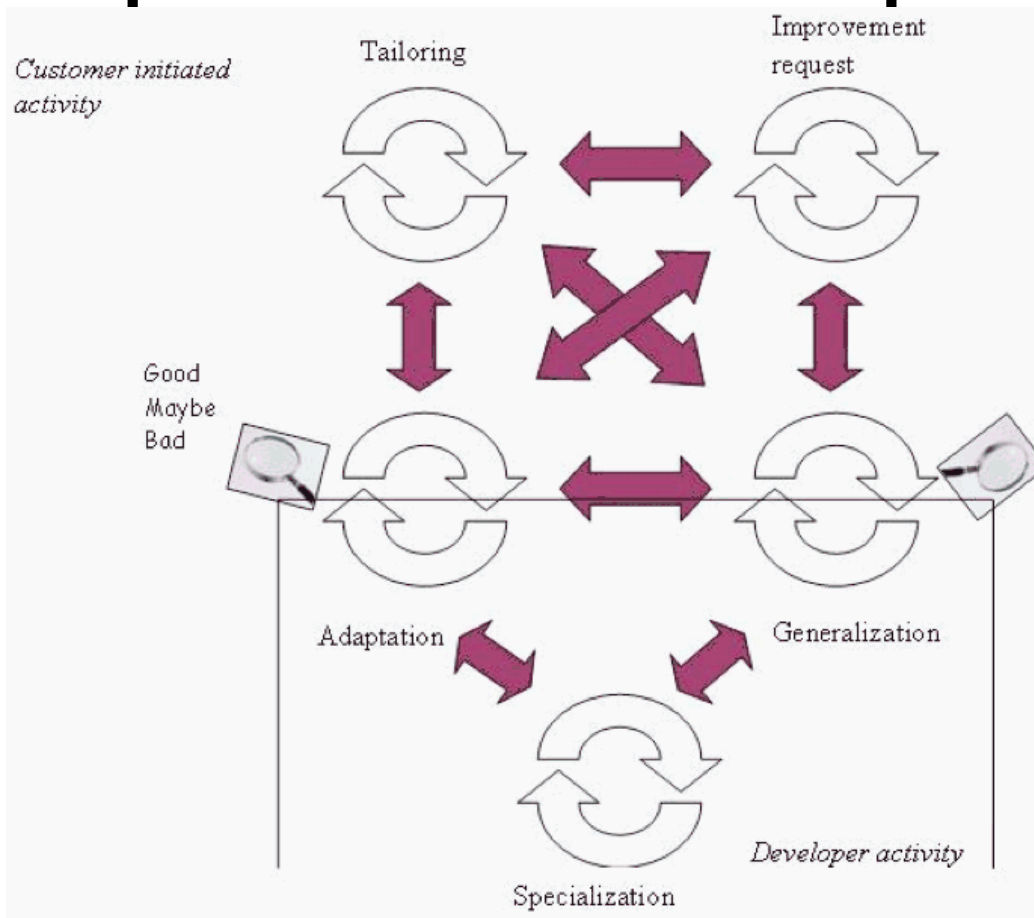


# Findings

- Tension between adaptation and generalization
  - One one hand company adapts products to individual customers, on the other they want to expand their product line to new markets and new customers
- Activity theoretical analyses of the tensions and the gradual transition from adaptation to generalization (Mørch, Nygård & Ludvigsen, 2009)



# Model of customer initiated product development



*Tailoring* when active end-users made adaptations on their own.

*Improvement Request* was when customers entered requests to the company about extra functionality, bugs-fix etc., viewed important from the customers' perspectives.

User option  
Patch  
New version

*Generalization* occurred when a new version of an existing product was released and made available to all customers.

*Adaptation* was when a customer requests for improvement(s) to an existing product and the company fulfilled the request for just this customer.

*Specialization* was when the professional developers at the company create in-house builds.



# Open issues for further work

- Implications for
  - Theory
    - New concepts, refinements and perspectives to enrich existing theoretical frameworks., e.g. “evolving artifacts”
  - Methodology
    - How to capture both short term user-driven innovation critical acts as well as long term production activity
  - Technology development
    - Web 2.0 should be more than communication and information sharing
    - Integrated design environments and other tools for users’ local development and rich info sharing are needed for full support of KM





# Summary and conclusions

- The three stages/phases of knowledge management (creation, organization, distribution) were also found in KIKK (e.g. tailoring, adaptation, generalization)
- It required taking boundary crossing into account because a large amount of “creation” takes place in customer communities and later “translated” by developers and customers in collaboration
- A new generation of ICT tools are needed to support KM 2.0: 1) local development (end-user dev.), 2) communication and information sharing



# References to own recent work

- Andersen, R., & Mørch, A. I. (2009). Mutual Development: A Case Study in Customer-Initiated Software Product Development. *Proceedings Second International Symposium on End-User Development (EUD 2009)*. Lecture Notes in Computer Science. Heidelberg: Springer (forthcoming).
- Mørch, A. I., Nygård, K. A., & Ludvigsen, S. R. (2009). Adaptation and Generalization in Software Product Development. In H. Daniels, Y Engeström, T. Gallagher & S. R. Ludvigsen (Eds.), *Activity Theory in Practice: Promoting Learning across Boundaries*: Taylor & Francis Books (forthcoming).

