

# **Dynamic Community**

## **A New Approach to Collaborative Knowledge Construction**

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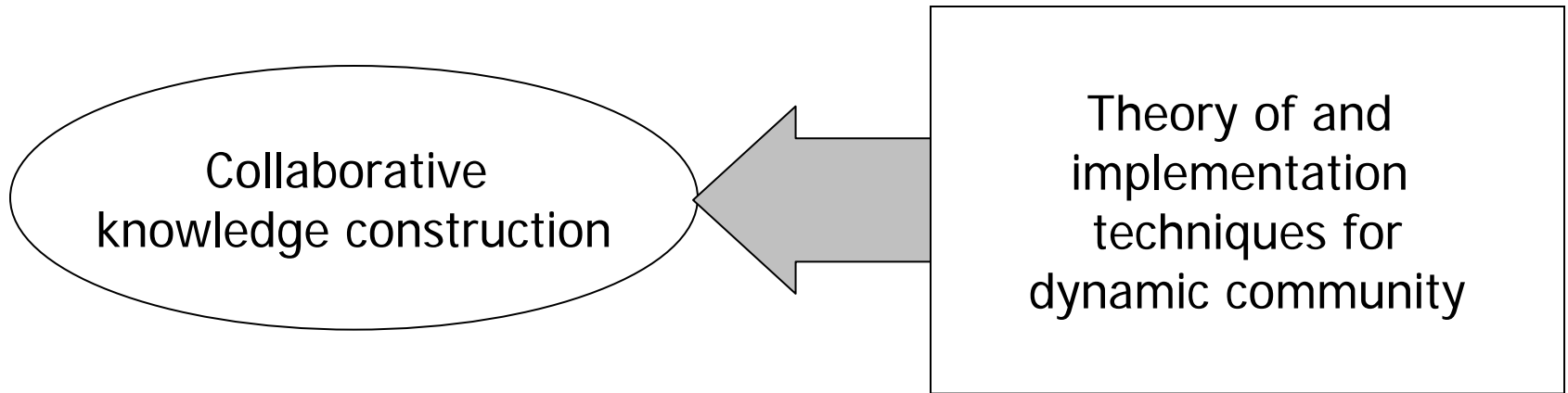
# Outline

- ▶ The DynC (Dynamic Community) project
- ▶ What's dynamic community and why?
- ▶ A generic scenario of forming a dynamic community
- ▶ Dynamic community theory applied to software reuse
- ▶ Challenges ahead

# Background of the DynC (Dynamic Community) Project

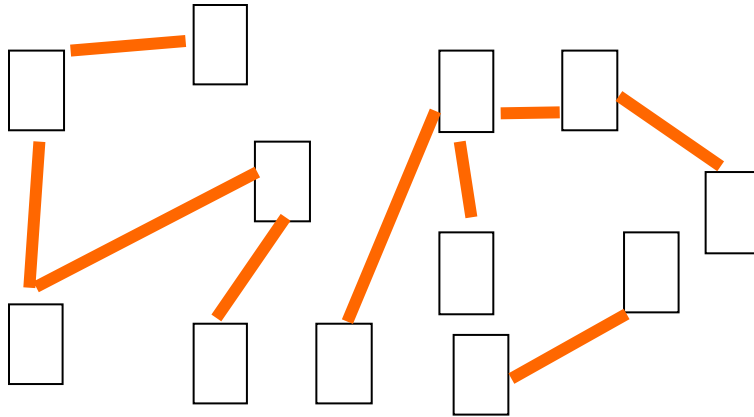
- ▶ Funding agency: Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan
- ▶ Period: Oct. 2003 – Mar. 2006
- ▶ Members
  - PI: Kouichi Kishida, SRA-KTL
  - Co-PI: Yunwen Ye, SRA-KTL
  - Kumiyo Nakakoji, University of Tokyo
  - Katsuro Inoue, Osaka University
  - Ken-ichi Matsumoto, NAIST
  - Senior Consultant: Yasuhiro Yamamoto

# Overall research goal



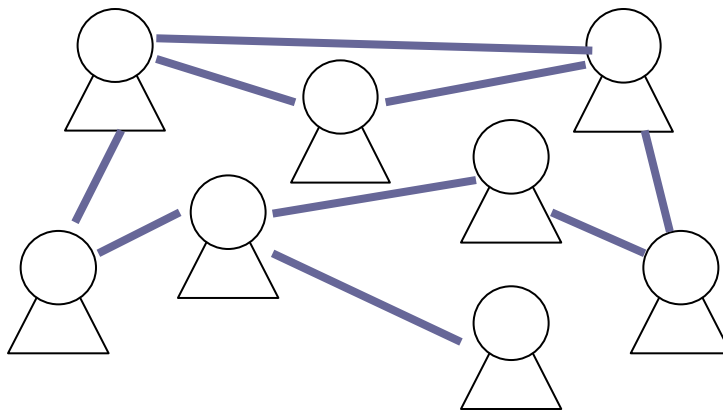
# Current collaborative knowledge construction approaches

Knowledge and knowledge-owners are separated



## Knowledge management

- Knowledge as commodity
- Achieving collaborative knowledge construction via collecting, managing, and sharing knowledge

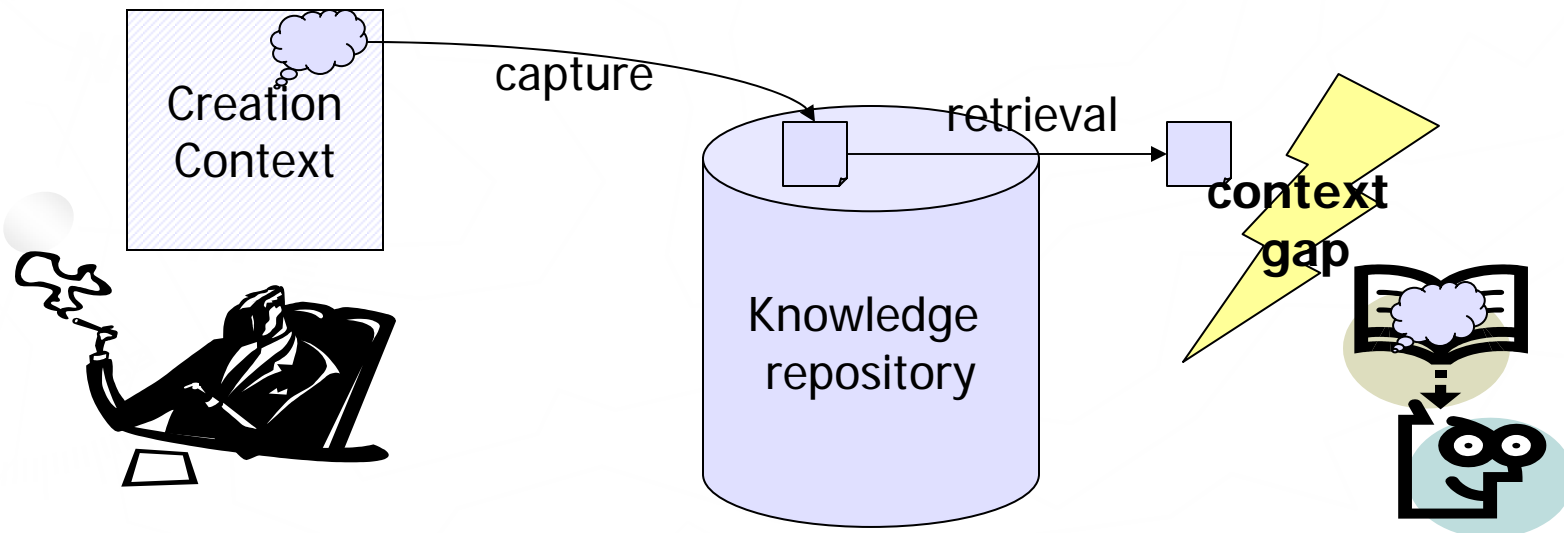


## Community

- Knowledge inseparable from the owner
- Achieving collaborative knowledge construction by supporting communications within a community

# Knowledge management

- ▶ Knowledge is a thing that is
  - Independent of context and knowledge owners
  - Specifiable
  - Transferrable
- ▶ The KM cycle
  - Creation – Capture – Retrieval – Use



# Community-based knowledge collaboration

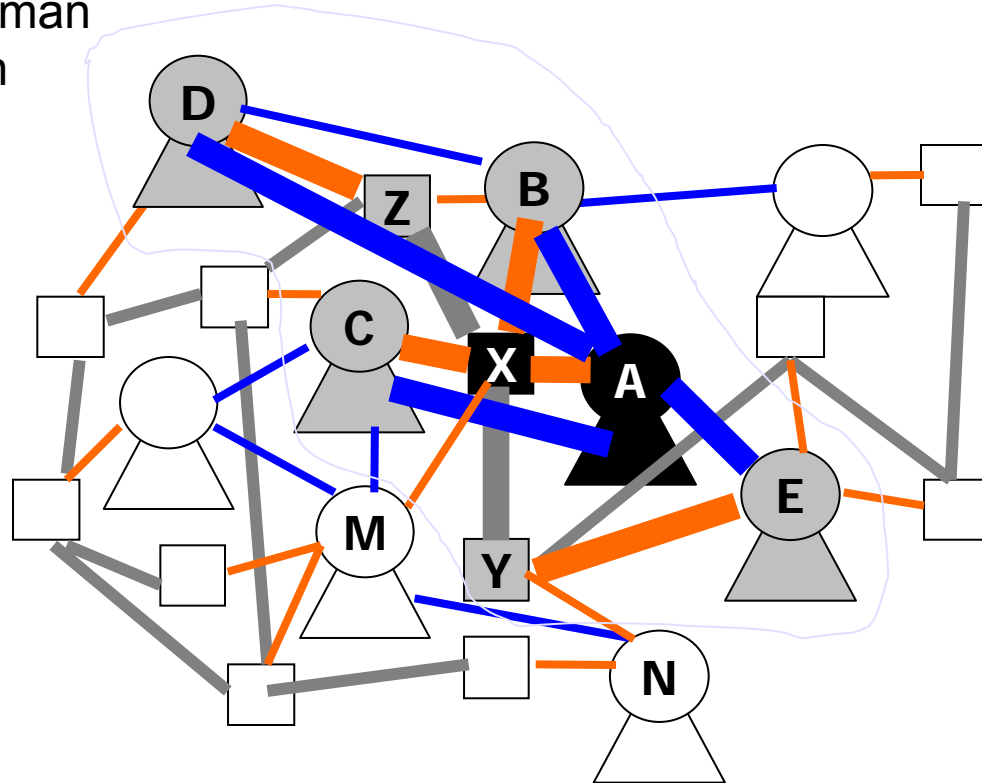
- ▶ Knowledge is not a thing; it's
  - Fundamentally tacit
  - Highly contextualized and individualized to knowledge-owners
  - Always reconstructed in a new context
- ▶ Sharing in a community
  - Knowledge transfers along social networks
    - ▶ Stories are effective tools
    - ▶ Individual mentoring

# Dynamic community: an integrated approach

Integrating knowledge and knowledge-owners

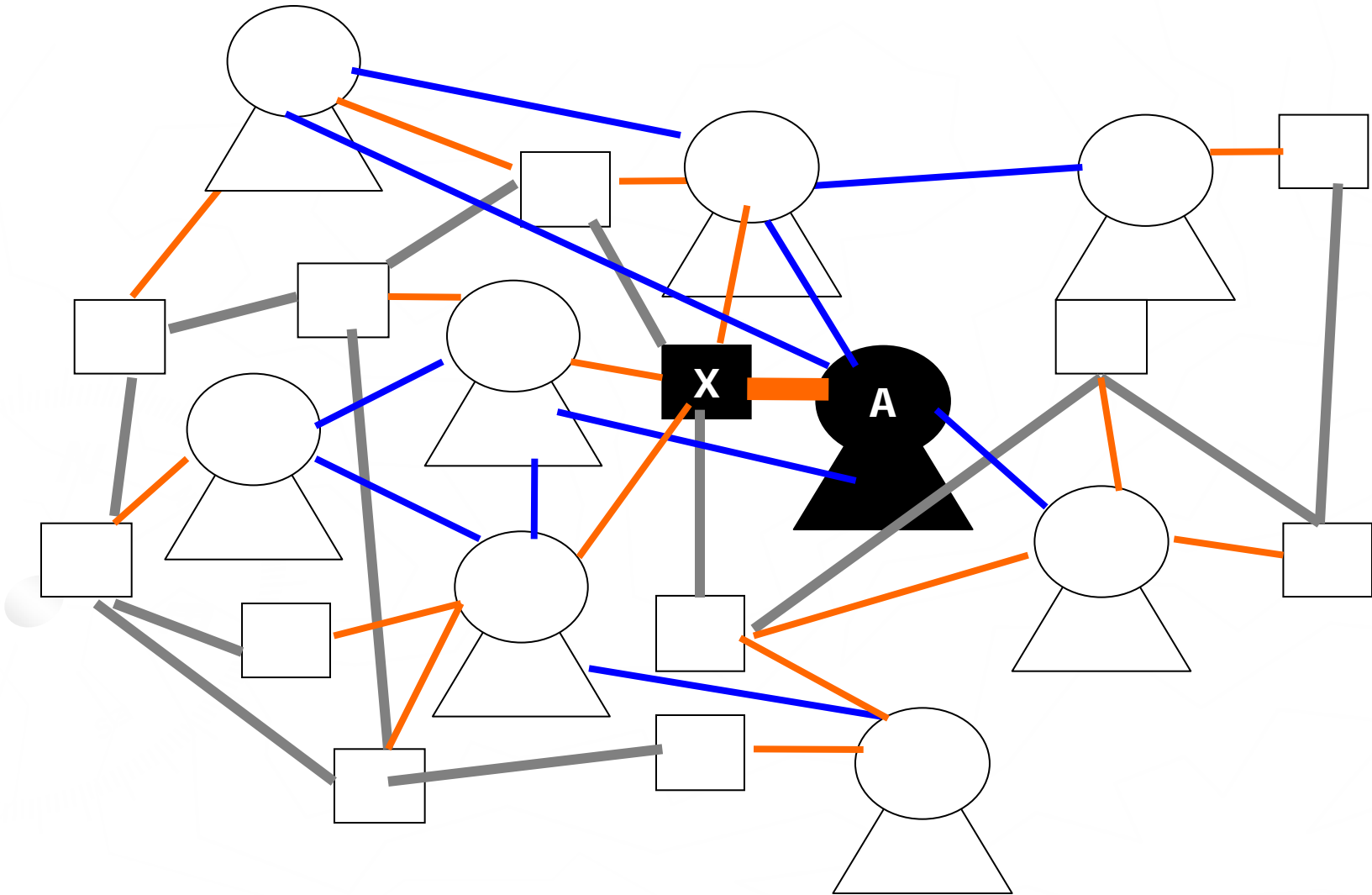
## Three dimensions of relationship

- Knowledge to knowledge
- Knowledge to human
- Human to human

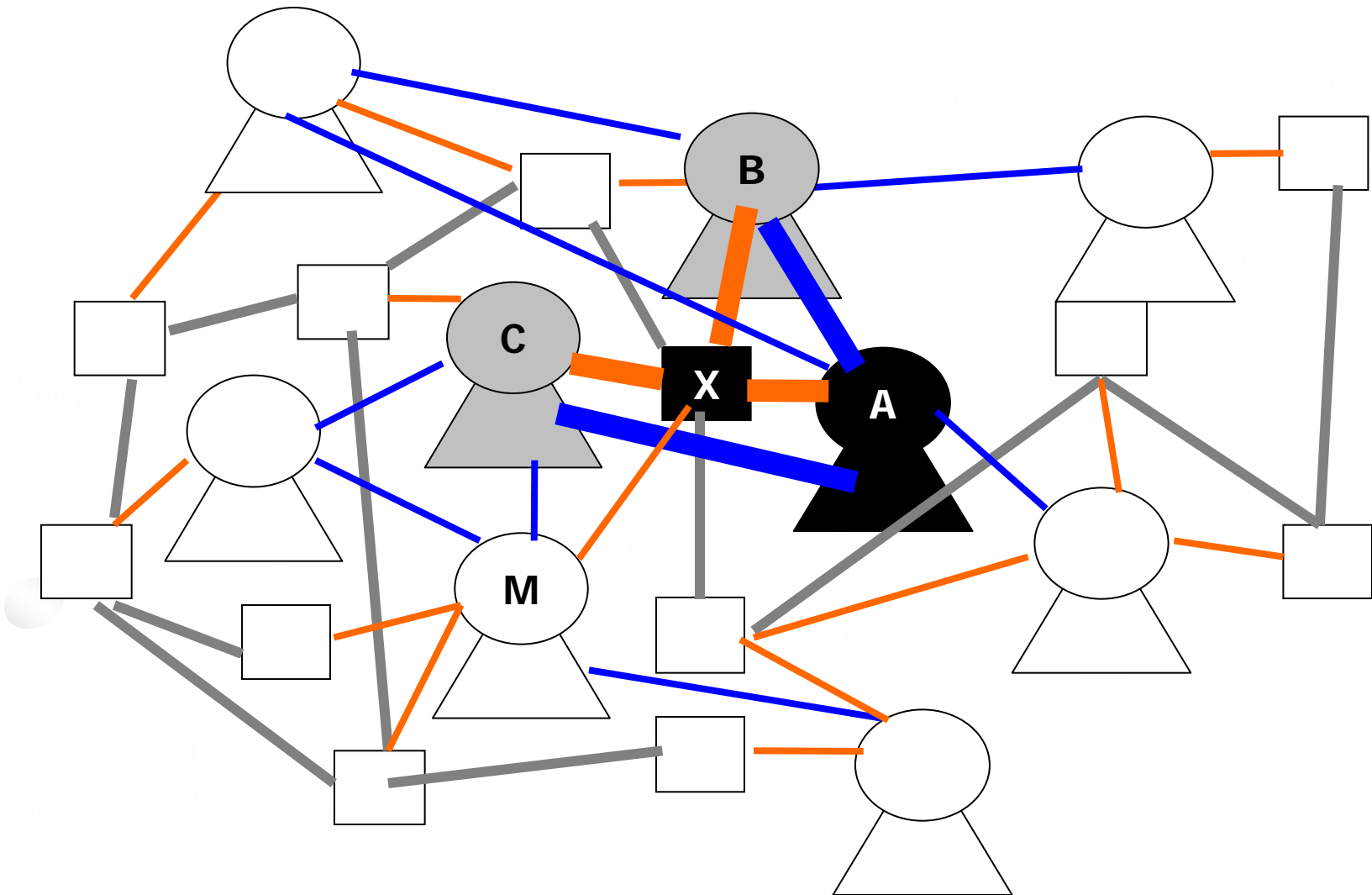




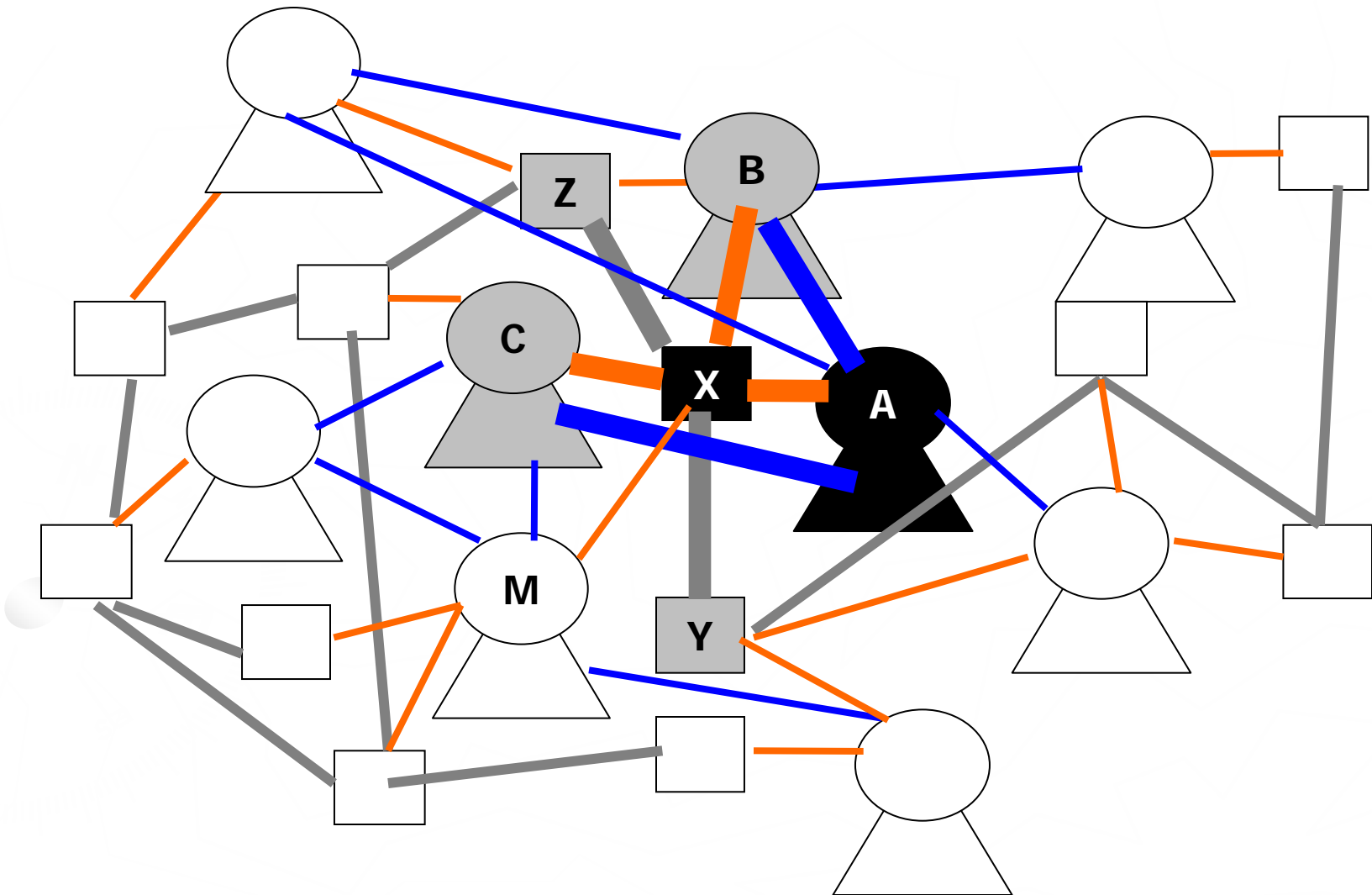
# The formation of a dynamic community



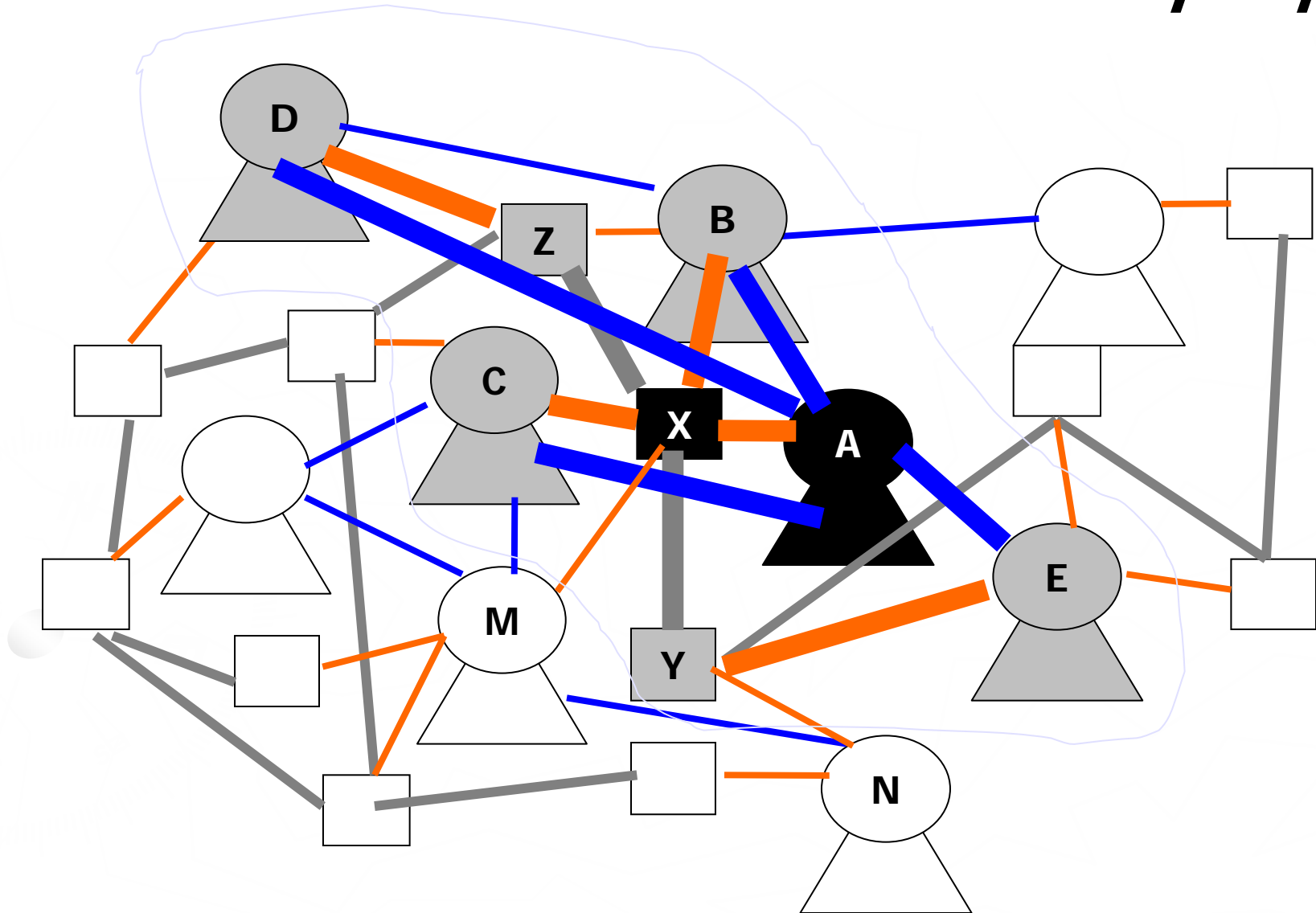
# The formation of a dynamic community: *from information to people*



# The formation of a dynamic community: *from information to information*

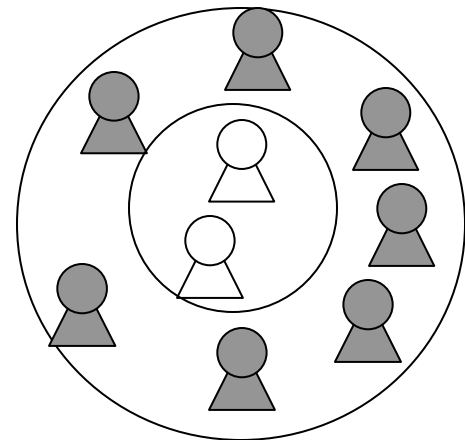


# The formation of a dynamic community: *from information to information to people*



# Problems with community of practice

- ▶ Communities exist for a relative long time once formulated
- ▶ Experts and novices are regarded as personal attributes and their roles remain stable for a long time
  - One-direction information flow from experts to novices
  - Overload of experts
- ▶ No consideration for the difference of individual tasks
  - Not dependent on the diversity and situatedness of an individual's task and information needs
- ▶ Little consideration of social relationship between members
  - Member relationship is not differentiated
  - Member relationship outside of the community is not considered

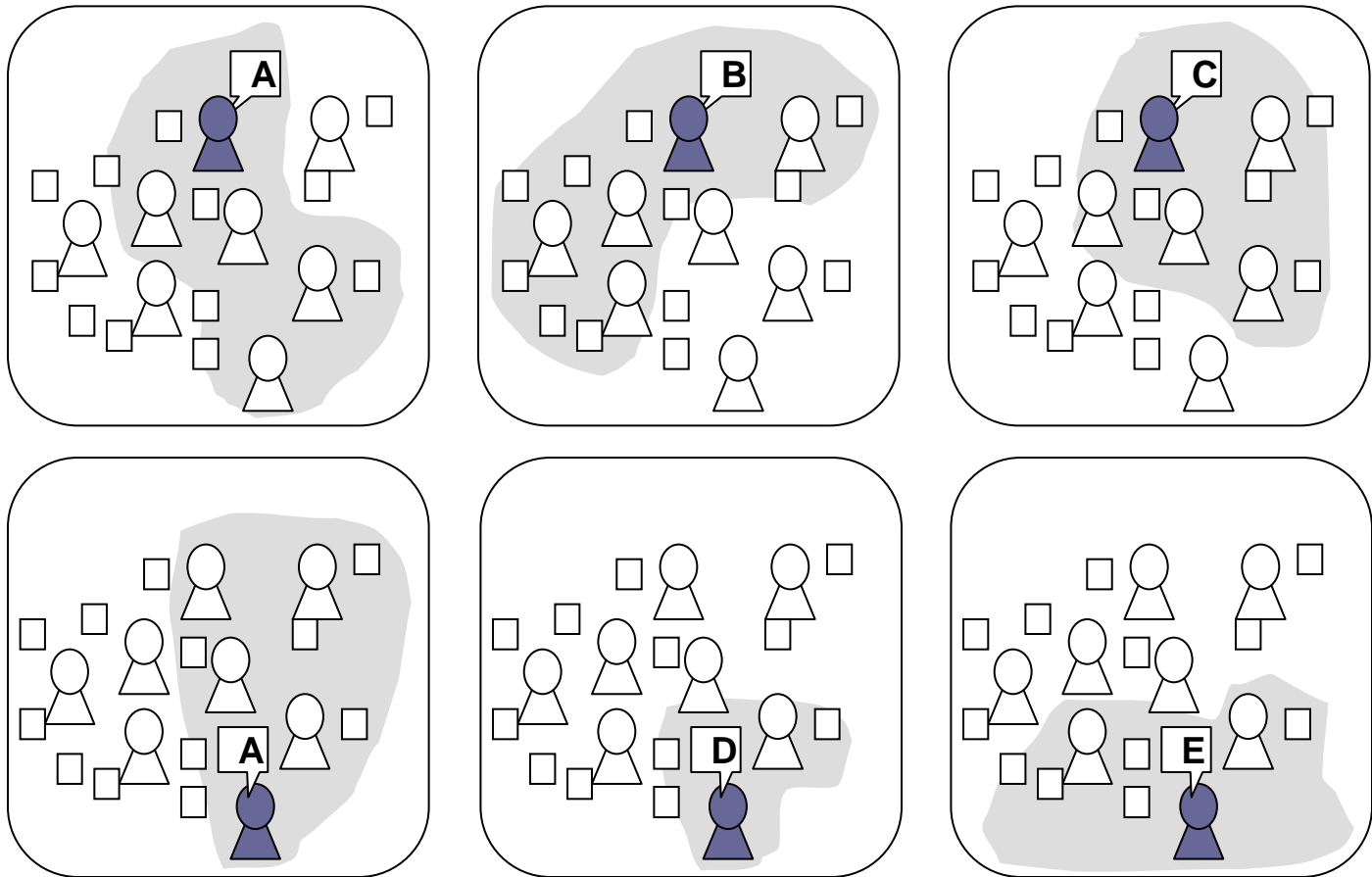


# Characteristics of dynamic community

- ▶ Ad hoc and On-demand
  - A social network of knowing that provides a specific platform for knowledge sharing and collaborative construction for a particular **individual** with a particular **task**
  - It is formed dynamically when the needs arise
- ▶ Task-specific
  - The network is formed for a specific task
- ▶ Member-specific
  - The network is formed for a specific member

# Task-specific and Member-specific

**Task specific:** for the same member, different task leads to a different community



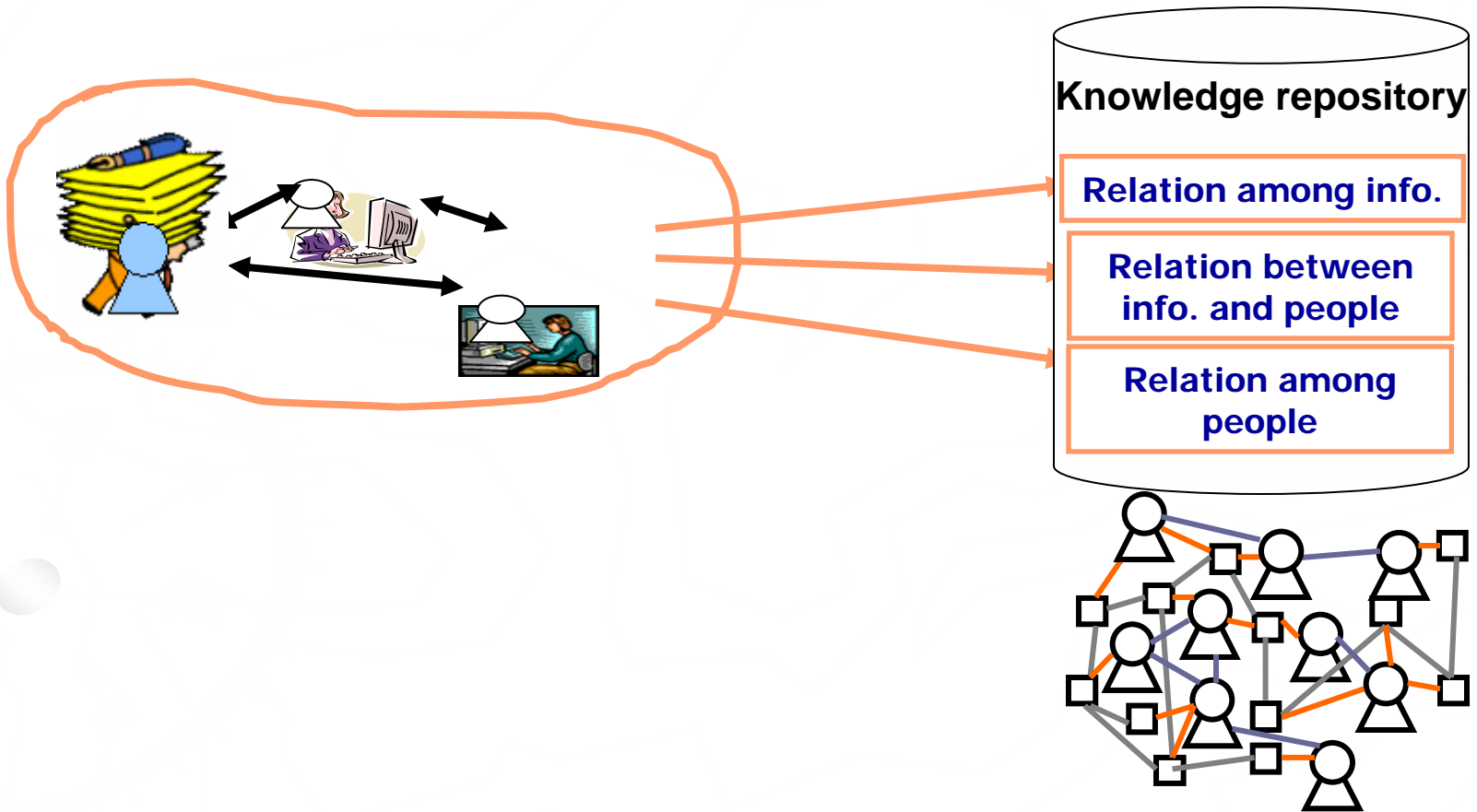
**Member-specific:** for the same task,  
different member leads to a different  
community

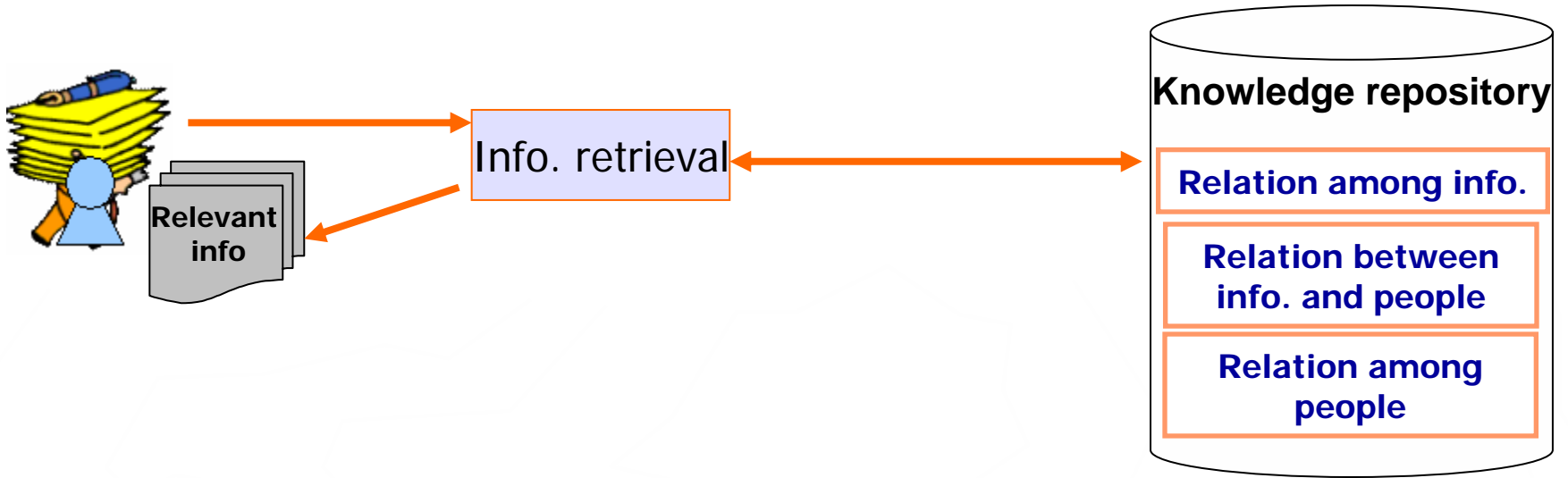
# **A generic scenario**

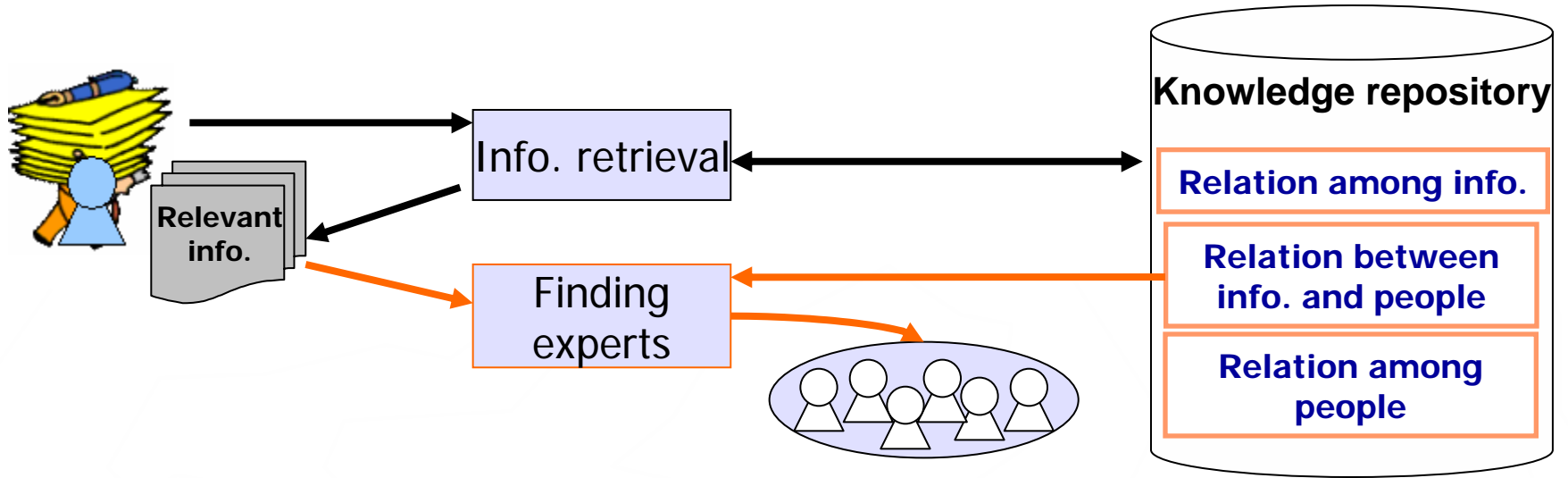
The process of forming a dynamic community

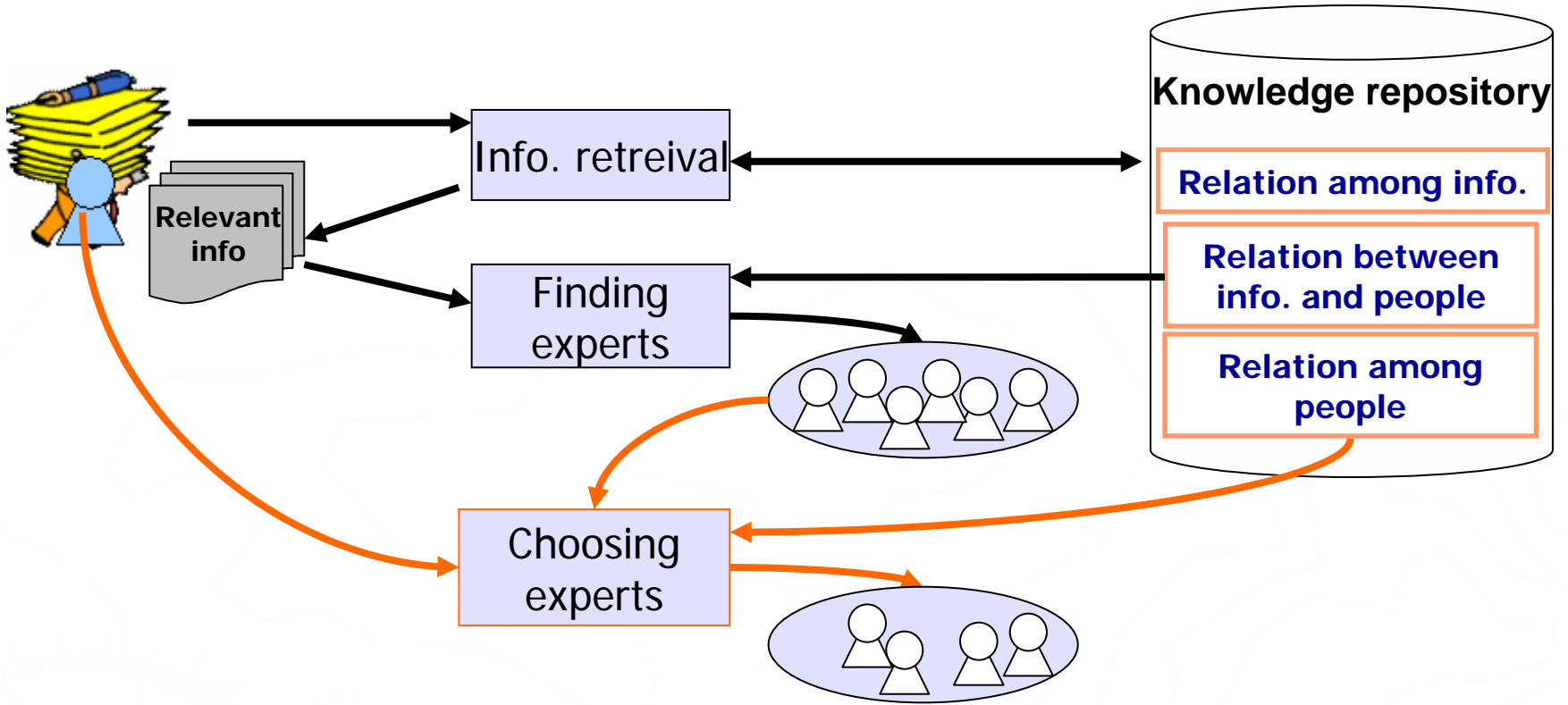


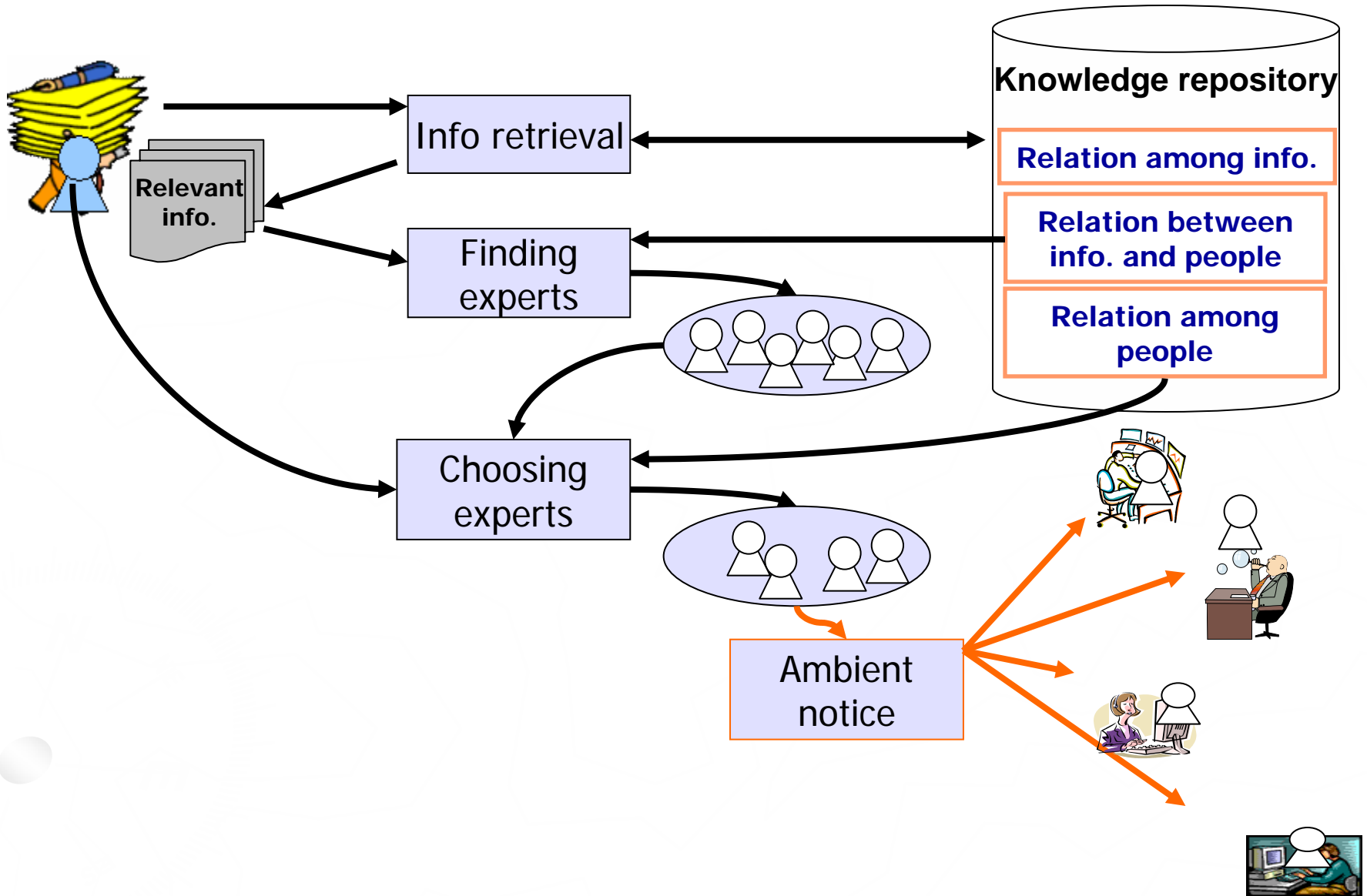
# Knowledge accumulation

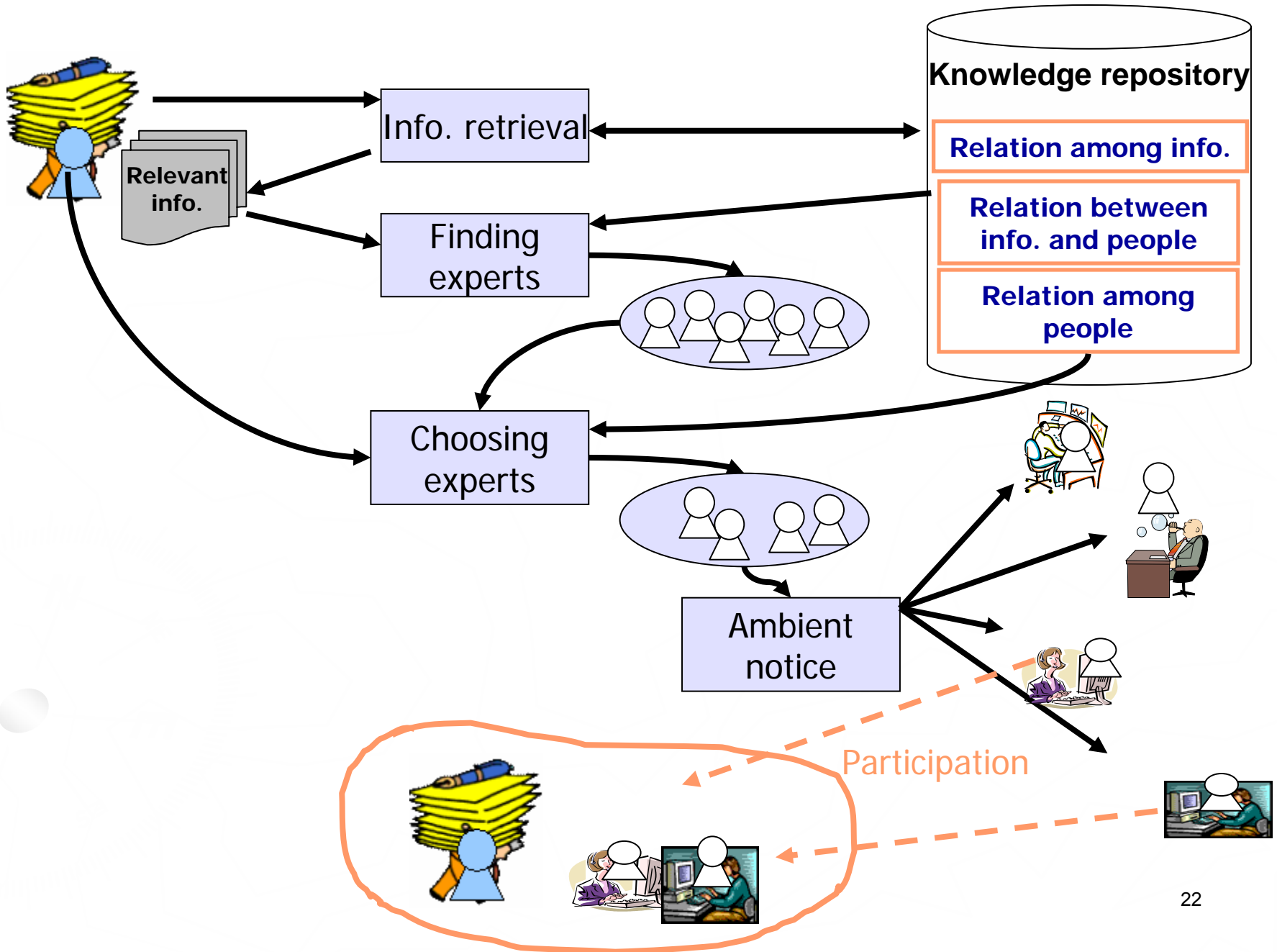













# **Creating dynamic communities that support software reuse**

A more concrete example in CodeBroker

# Delivery of task-relevant components



```
emacs@partner.cs.colorado.edu
Buffers Files Tools Edit Search Mule JDE Java Help

import java.lang.*;

class Chi2Eng {
    /** constructor */
    void Chi2Eng (String initVal) {
    }
    /** just set the internal value */
    void setValue (String val) {
    }
    /** translate to the English format and return it */
}

--:** Chi2eng.java (JDE)--L10--All-----
1 0.23 isGroupingUsed Returns true if grouping is used in this format.
2 0.18 isParseIntegerOnly Returns true if this format will parse numbers.
3 0.15 format Returns pattern with formatted objects.
4 0.15 getCurrencyInstance Returns a currency format for the specified locale.
5 0.15 getPercentInstance Returns a percentage format for the specified locale.
6 0.15 format Specialization of format.
7 0.15 format Specialization of format.
8 0.15 format Specialization of format.
9 0.15 format Specialization of format.
10 0.15 format Specialization of format.

-1:** *RCI-display* (ReusableComponentInfo)--L9--Top-----
java.text.NumberFormat::final java.lang.String format(double number)
```

(a)

(b)

(c)



# From component to the document

The image shows two windows side-by-side. The left window is Emacs, displaying Java source code for a class named `Chi2Eng`. The right window is Netscape, displaying the documentation for the `java.text.NumberFormat` class, specifically the `format` method.

**(a)** Emacs window showing source code:

```
import java.lang.*;

class Chi2Eng {
    /** constructor */
    void Chi2Eng (String initVal) {
    }
    /** just set the internal value */
    void setValue (String val) {
    }
    /** translate to the English format and return it
```

**(b)** Netscape window showing documentation for `format`:

```
format

public final String format(double number)

Specialization of format.

See Also:
    format

format

public final String format(long number)

Specialization of format.

See Also:
    format
```

**(c)** Emacs window showing a table of methods:

Line	Method	Description
1	<code>isGroupingUsed</code>	Returns true if grouping is used.
2	<code>isParseIntegerOnly</code>	Returns true if this format only parses integers.
3	<code>format</code>	Returns pattern with formatted objects.
4	<code>getCurrencyInstance</code>	Returns a currency format for the specified locale.
5	<code>getPercentInstance</code>	Returns a percentage format for the specified locale.
6	<code>format</code>	Specialization of format.
7	<code>format</code>	Specialization of format.
8	<code>format</code>	Specialization of format.
9	<code>format</code>	Specialization of format.
10	<code>format</code>	Specialization of format.

**(c)** Emacs window showing the signature for `java.text.NumberFormat::final java.lang.String format(double number)`.

# From component to example

```
emacs@partner.cs.colorado.edu
Buffers Files Tools Edit Search Mule JDE Java Help

import java.lang.*;

class Chi2Eng {
    /** constructor */
    void Chi2Eng (String initVal) {
    }
    /** just set the internal value */
    void setValue (String val) {
    }
    /** translate to the English format and return it */
}

--:** Chi2eng.java (JDE)--L10--All-----
return (d);
}

/** print a double */
public static void print(double d, int n) {
    NumberFormat nf = NumberFormat.getInstance();
    nf.setMaximumFractionDigits(n);
    nf.setGroupingUsed(true);
    System.out.print(nf.format(d) + " ");
    System.out.flush();
}

*CB-Example*/home/jane/java/exercises/10utils.java (JDE)--L41--652-
1 0.23 isGroupingUsed Returns true if grouping is used in this format.
2 0.18 isParseIntegerOnly Returns true if this format will parse numbers.
3 0.15 format Returns pattern with formatted objects.
4 0.15 getCurrencyInstance Returns a currency format for the specified locale.
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-1:** *JCI-display* (ReusableComponentInfo)--L9--Top-----
java.text.NumberFormat;final java.lang.String format(double number) (c)
```

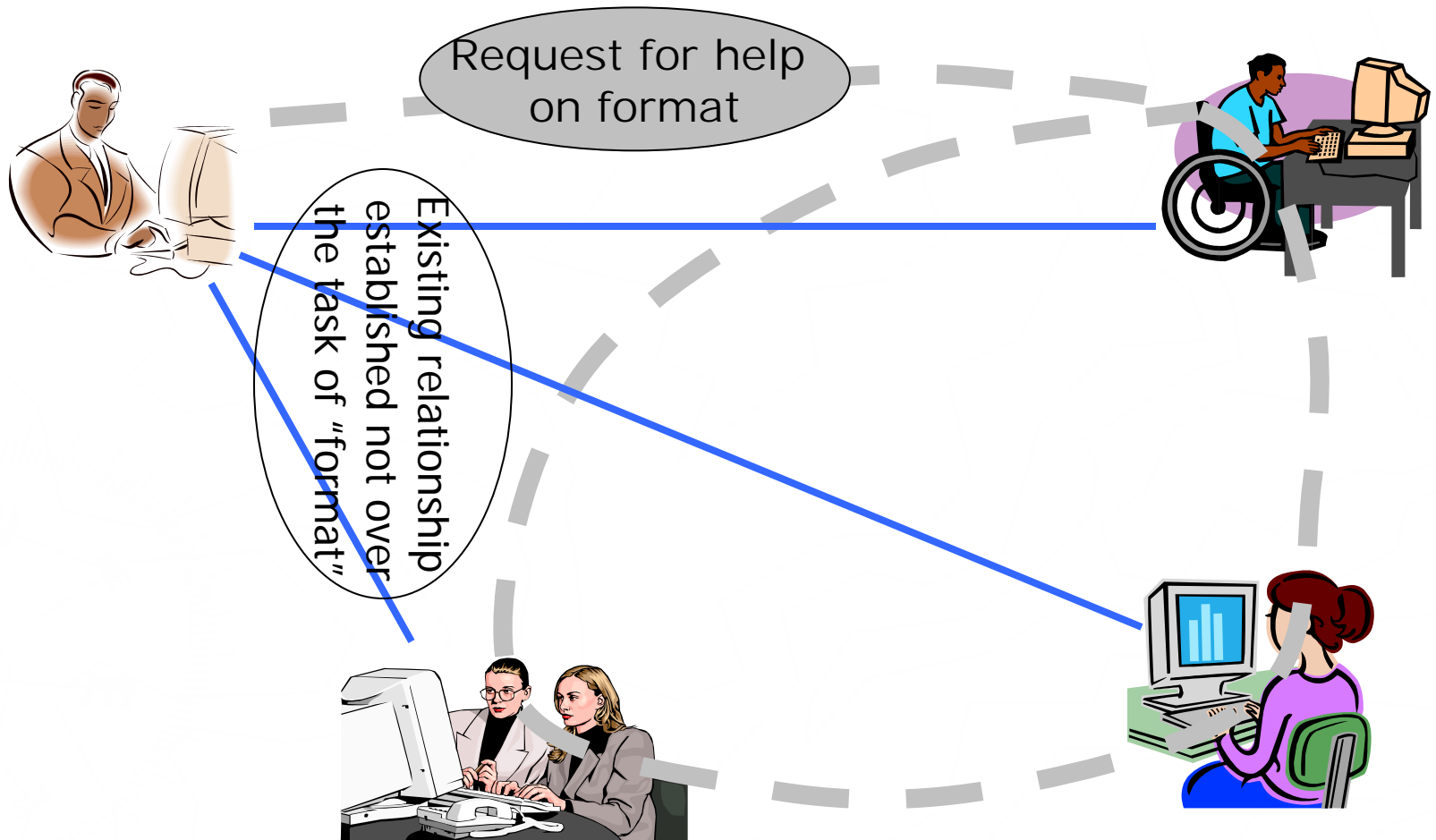
(a)

(e)

(b)

(c)

# Finding experts with Choochoo Messenger



# Offering help

Request for help  
on format



Messenger's Track

[format - Jack]

MessageViewer

**Subject:** format

**Sender:** Jack@Colorado.EDU

> This is Jack. I want to use java.text.NumberFormat.format  
> to convert a number written in Chinese format to Western  
> format. Could you help me with this? Thank you.

Okay, come to my office or call me at 123-4567.

---

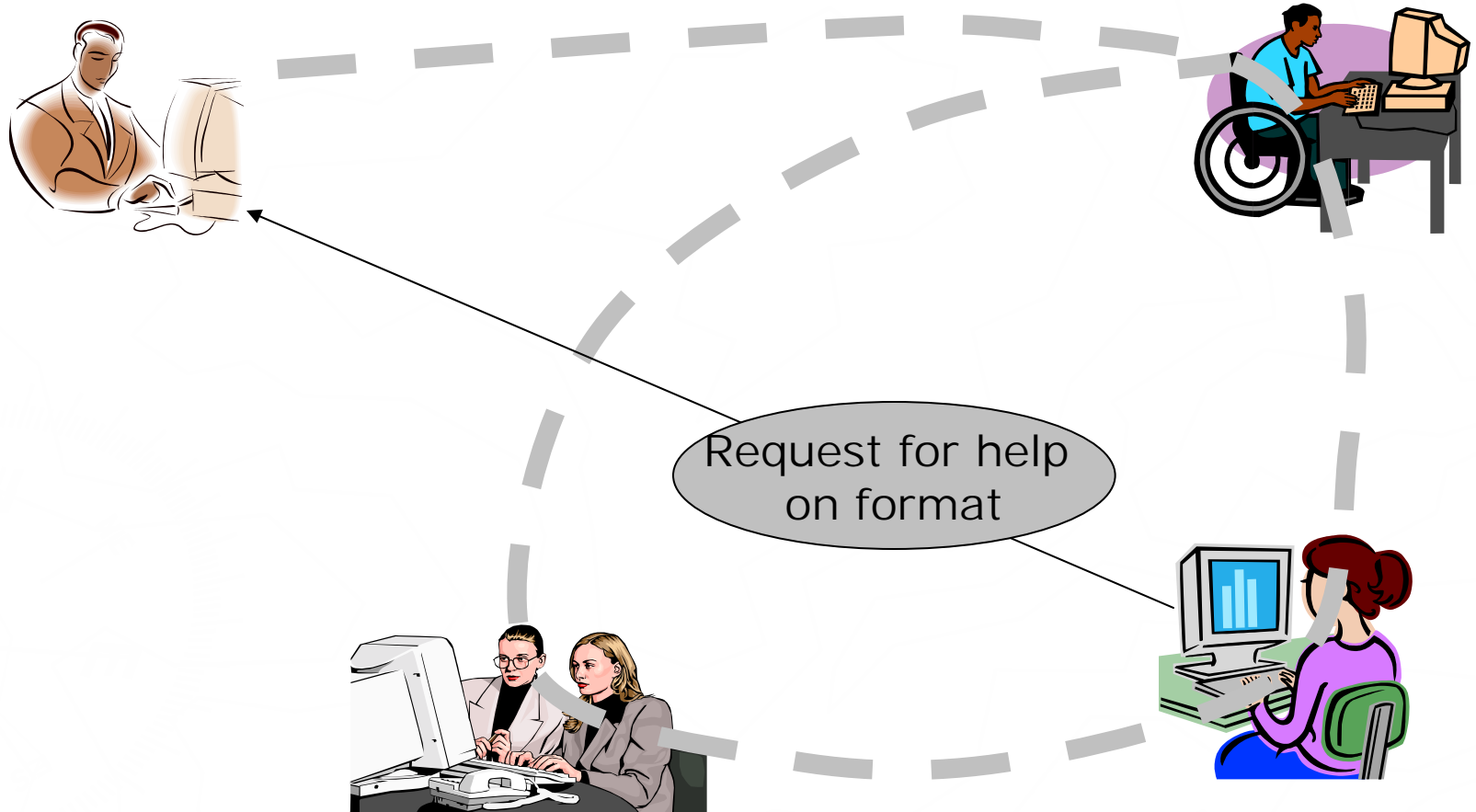
Mary@Colorado.EDU

Close Messenger      Help      Ignore

```
self.wfile.write(m)
if content_length > 0:
    mcf.read(content_length)
```



# Collaboration



# Research challenges ahead

Theoretical questions

Technical questions

Social questions

# Theoretical questions

- ▶ Relationship with community of practice, community of interest, intensional network and other similar theories

	<b>Community of Practice</b>	<b>Community of Interest</b>	<b>Intensional network</b>	<b>Dynamic Community</b>
<b>Granularity</b>	Domain	Problem	Project	Task
<b>Bonding factor</b>	Shared identity	Symmetry of ignorance	Shared work history	General reciprocity
<b>Focus of relationship</b>	Individual to community	Individual to community	Individual to individual	Individual to individual
<b>Motivation</b>	Learning to be	Shared understanding	Divided labor and roles	Asynchronous mutual learning
<b>Persistence</b>	Long-term	Short-term	Long-term	Short-term (shortest)

# Technical problems

- ▶ Methods of capturing and representing the relationship between
  - knowledge and knowledge owners
  - people
- ▶ Retrieval of relevant information
- ▶ To achieve task-specificity, identifying experts for the specific task
- ▶ To achieve member-specificity, identifying experts who are willing to help the specific member based on their past interaction history over different tasks or even in different domains



# Social problems

- ▶ Experts' attention economy:
  - Unobstrusive ambient peripheral notification mechanisms
  - Recipient preference
    - ▶ Experts decide to participate in the dynamic community or not
  - Workload balancing
    - ▶ Don't always ask for help from the same experts
- ▶ Motivation to participation
  - Explicit recognition of community participation
  - Community participation = accumulation of social capital
    - ▶ Representation of social capital
    - ▶ Paying the social capital debit by returning individual favor
    - ▶ Investing in social capital for future gain

# Social capital of individual and community

- ▶ Individual social capital: social resources that can be drawn from others by an individual
  - $SC_j = \text{Sum}(\text{favors to others by } j) - \text{Sum}(\text{favors owed by } j)$
  - $\text{Sum}(SC_j) = 0$
- ▶ Social bonding force
  - $SBF_{ij} = \text{Sum}(\text{favors from } i \text{ to } j) + \text{Sum}(\text{favors from } j \text{ to } i)$   
 $= \text{Sum}(\text{social capital transaction between } i \text{ and } j)$
- ▶ Gross community capital: a measurement of the strength and liveliness of a community
  - $GCC = \text{Sum}(\text{favors to others by } j) + \text{Sum}(\text{favor owed by } j)$   
 $= \text{Sum}(SBF_{ij})$   
 $= \text{Sum}(\text{social capital exchanged in each transaction})$

# Summary

- ▶ Dynamic community is
  - ad hoc
  - on-demand
  - temporal
  - task-specific
  - member-specific

*It's not "it's what you know; it's who you know"; it's both.*