Research Methods for Collaborative Work

Wendy E. Mackay

How do we study collaborative behavior?

Traditional methods:
- Questionnaires
- Focus groups
- Census studies

Social Media changes everything!

Recent examples:
- Natural experiments
- Google's experiments
- Obama's election campaign
- Global gene databases
- MOOCs: Massive open on-line courses

Questionnaires

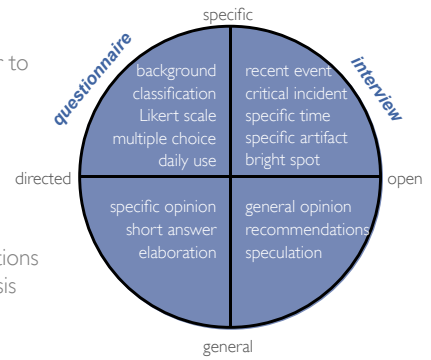
What are the advantages of a questionnaire?

What are the disadvantages?

Choose questions that support design

Interviews
- Few answers
- Can delve deeper to find out more
- Analyze by hand

Questionnaires
- Many answers
- Difficult to ask follow-on questions
- Automated analysis possible



Questionnaires

Goal: Obtain data from a large number of users

Careful! Questions may not really address the questions you think they are (external validity problem)
Response rates are lower than with interviews
People may respond:
- more honestly for embarassing questions
- less honestly for other types of questions

Design a questionnaire

What information are you seeking?
Ask no more than what is necessary
Frame questions carefully

Who is the audience?
50 - 1000 users … or more?

How will you send your survey?
Most often with a survey web app
But sometimes paper is better

How will you analyze your results?
Consider the statistical analysis first

Question styles

Specific questions: You restrict the topic

General questions: Respondant can answer as they like

Directed questions: You define how the user answers (number, ranking, multiple choice …)

Open questions: Respondant chooses how to answer (usually a text field)

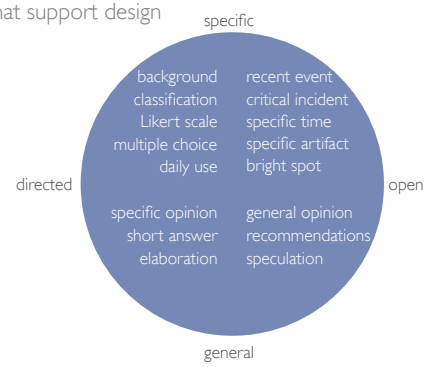
Question order matters!!!

Choose questions that support design

Start with specific then general

Start with directed then open

Start with facts then opinions



Question styles: Specific – Directed

Restricted topic with restricted answer format:

Background questions:

Age o < 20 o 21-30 o 31-40 o > 40

Gender o male o female

Profession: (pull-down list)

Topic questions:

Number of messages received today? _____

Number of messages you deleted today? _____

Question styles: Specific – Open

Restricted topic with open answer format:

Topic questions:

Critical incident: In the past week, did you have trouble finding a specific email message? If so, describe what heppened.

_____

Bright spot: In the past week, did you have an email exchange that successfully resolved a problem? If so, describe what happened.

_____

Specific time: Choose a set of 10 messages from yesterday afternoon and describe how you dealt with each one.

_____

Question styles: General – Directed

Respondant interprets topic with restricted answer format:

Topic questions:

What feature would you add to improve the email system?

_____

Should we add filtering to the mail system?

o yes o no explain: _____

Question styles: General – Open

Respondant interprets topic with open answer format:

General questions:

Opinion: What do you think of your email browser?

_____

Suggestion: Do you have any suggestions for improving the email interface?

_____

Speculation: Would you use the new email filter on a regular basis?

_____

Question formats

True / False
boolean
Do you use Safari?
o yes o no

Short answer
nominal
Which browser do you use?
_____

Multiple choice
nominal or ordinal
Which browser do you use?
o Explorer o Firefox o Safari o Other _____

Restricted category
nominal or ordinal
Which is your favorite browser? (choose *one):*
o Explorer o Firefox o Safari o None of these

Question formats

Ranking
ordinal or interval
Rank browsers from best (1) to worst (3):
____ Explorer
____ Safari
____ Firefox
____ Other _____

Scalar (Likert)
ordinal or interval
I can easily manage my email (circle one):

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
-2	-1	0	1	2

Free answer
nominal
Describe how you manage your email.
_____

Principles for designing questions

Use parallel structure for sentences

Keep the order coherent, e.g. positive to negative

Zero can mean two things:
neutral, middle response
or "I do not know"

Consider adding a degree of confidence
Avoid asking 'obvious' questions

Ask the same question in two different ways
to see if you get the same result

One more reminder

Directed, specific questions
are easist to code
belong at the beginning of the questionnaire
provide the fewest interesting results

Open, general questions
are very difficult to code and analyze
may provide very interesting responses
but also risk giving stereotypical responses

Interviews vs. questionnaires

The same question types work for both
- but the goals are different
- and the analysis is different

Advantages of interviews:
- easier to get in-context information
- easier to get real-world stories
- easier to probe deeply into an interesting situation

Avantages des questionnaires:
- can ask lots of people
- simple questions are easy to tabulate
- often used for opinions

Design vs. Marketing

Designers need facts to inform the design
- examples of problems, stories about events,
- data about use

Marketing wants opinions
- what people like and do not like,
- what they think they want

Emphasize facts first, then opinions
- Directed questions (specific or open-ended) often elicit facts
- General questions (specific or open-ended) often lead to opinions

Consider a series that builds:

Create a series of questions for which each can be classified as:

- Direct or Open?
- Specific or General?
- Factual or Opinion?
- Interview or Questionnaire? (or both)
- Beginning or End? (or anywhere)
- Design-oriented or marketing-oriented?

Exercise: Questionnaire

Design a set of questions to evaluate this class

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Research Methods

Participatory design
Cultural probes
Technology probes
Controlled lab studies
Quasi-experiments
Field studies
Field experiments
Logging experiments
Natural experiments
Interactive thread
MOOC - Massive open on-line course

Participatory Design

Include users and designers in collaborative design

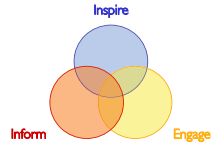
Participatory Design

Techniques include regular and video brainstorming, developing scenarios, paper prototyping and video prototyping

Cultural probes

Purpose
- Exploration of Research/Design Space
- Challenge assumptions
- Validate predictions
- Look for unexpected
- Gather subjective, intimate material
- Dialog with users

Deployment
- Involve users
- Consider privacy
- Required resources
- Length of time

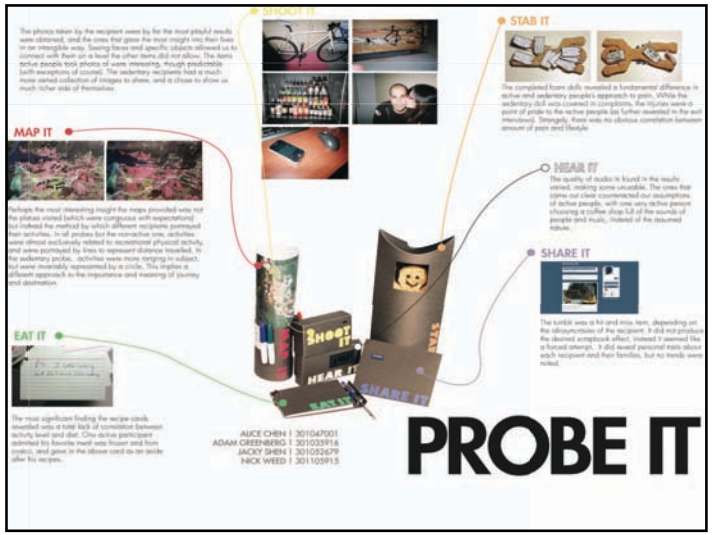


Classic probes:

disposable camera with questions
diaries
dream recorder

Cultural probes for InterLiving project

"Probe kit" sent to users
with stamped envelopes to return materials



Technology Probes

Goals:
- inspire users and designers to generate new design ideas
- understand how a technology is used in a real world setting
- study emergent behavior patterns around new technologies
- create common ground for subsequent design

Combine three perspectives:

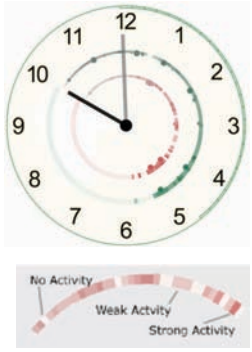
Scientific:	collect data about users *in situ*
Engineering:	test technical infrastructure
Design:	inspire new ideas

Marker Clock

Interact '07, JCSCW '10

Peripheral awareness for seniors at home
- Monitoring vs. Peer-care
- Implicit sharing: movement on clock face
- Explicit sharing: leaving markers

Field tested with seniors in France
- Easily interpretable by people who know each others' rhythms and routines



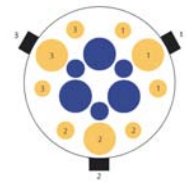
WeMe

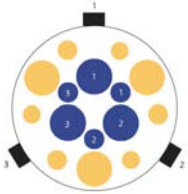
HCII'09

A "Conversation Piece" that supports multiple engagement and multiple interpretation.

Bubbles move in response to ambient sounds (local and distant)
1-3 people per household can create patterns

WeMe





Nightboard

Wautier MA '06

Remote couples stay in touch

Input:
- movement detector
- laser pointer

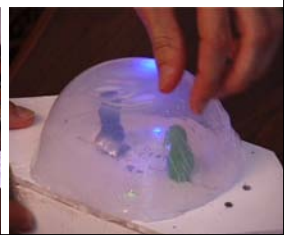
Display:
- projection on the ceiling

Supports both
direct and implicit interaction

MissU

CHI '09

Sharing 'Empty Moments' between remote couples
- Private 'radio channel'
  - Implicit : shared ambient sounds (dual control)
  - Explicit : shared music playlists
- Exploration with 13 couples via technology probes
  - Social Science, Technology & Design results



A20

NIME'09, Sonic Interaction Design'11

Shared music player
- 20-sided icosohedron
- triangular speakers

Interaction :
- movement in space

Play & share
- music

with Sony CSL

Focus groups

Generally used in marketing
Qualitative approach:
Ask a group of people their opinions or beliefs about a product or idea

Interactive group setting, where everyone can talk

What are the advantages?
Disadvantages?

Natural experiments

Gerber and Green used publicly available information to study situations in which people are randomly allocated to different groups.

Example:
Draft

Salaries for men who were drafted are 15% lower

Field experiments

Russell at Google creates huge controlled field experiments with a million subjects per condition

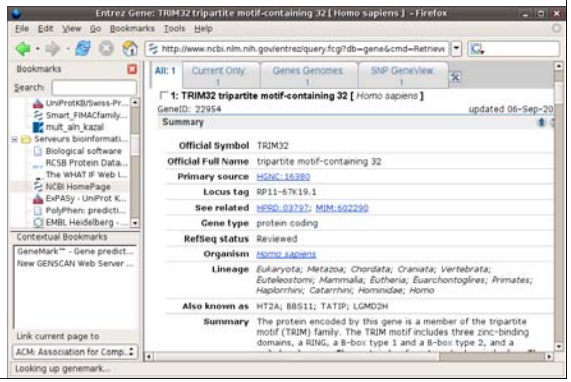
Example:
Does the background color affect liklihood of buying?
(Yes! 20% more with certain colors)

Obama's campaign:
Send different ads to randomly selected people
Follow up calls: Which work best and on whom?

Discovered Republican women who were affected by national healthcare proposal

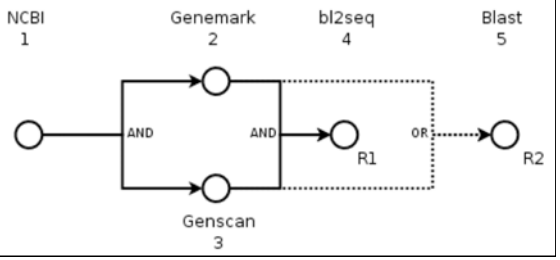
Controlled field study: PageLinker

Contextual bookmarks



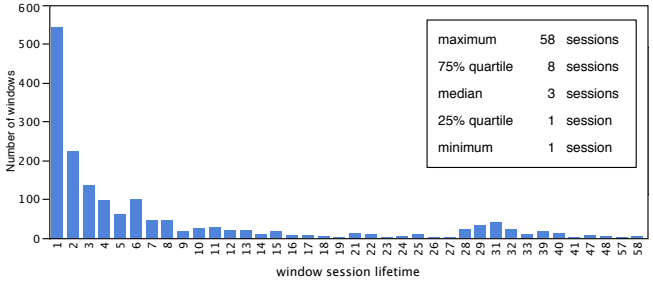
Controlled field study: PageLinker

4-week field experiment: ABAB within-subjects design
Scenarios with 5 search tasks:
Peform task 1, then 2 or 3, then 4 when tasks 1-3 complete.
Task 5 is independent of tasks 1-4.



Logging study - WM Lisa

What is the lifetime of a window on the screen?
Log state of every window over two weeks
Critical incident-style pop-up questions



Logging study - WM Lisa

Why do people abandon windows on their screens?
From reminders to forgotten windows

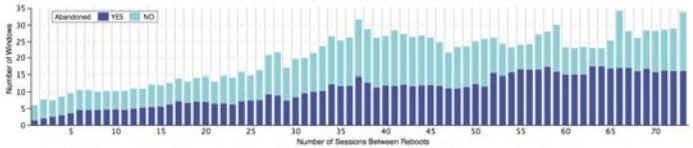


Figure 2. Piling up windows: the number of opened and abandoned windows per session increases with sessions in between reboots.

Weaving an interactive thread

Crowd-sourced design without the web

Wendy E. Mackay
INRIA, in|situ

DIS conference

Event Design for DIS 2002

Create a focal point: Henrik Färling's poster based on interLiving data

Create a series of exercises
- 10 exercises
- 10 minutes
- end of session building upon each other

Goal: collaborate on a common design

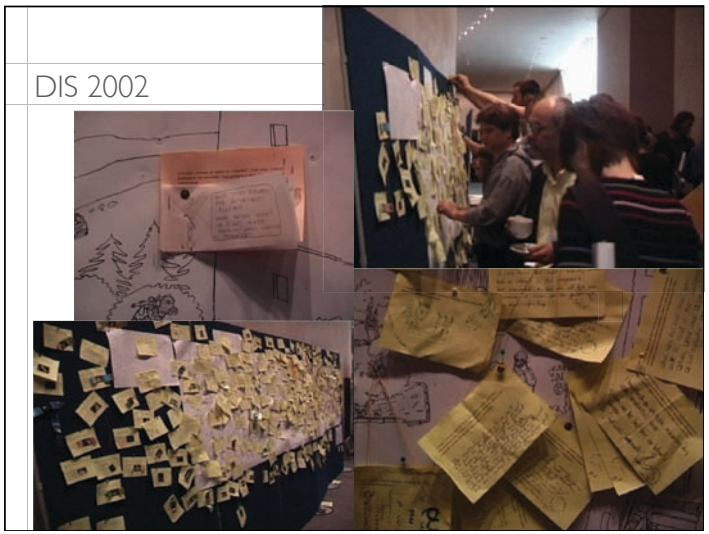
Design Brief: DIS 2002

Interactive event
- Meet people, share ideas, have fun

Share multi-disciplinary design methods
- Learn about different techniques from different perspectives

Gather information for the interLiving project
- … to find out more about remote families

DIS 2002



Evaluation

Participants:
- 30% computer science
- 34% designer
- 34% social science

80 'core' participants

75% met new people
66% learned new techniques

Possible interactive thread events

Post-class exercise
- students perform exercises just before the bell rings

Experiment debriefing
- subjects interview each other after a session

Corporate meetings
- expose everyone to interactive design techniques

Seminars or conferences (sessions or banquets)
- get specialized interviews from doctors, air traffic controllers, fighter pilots and other hard-to-access users

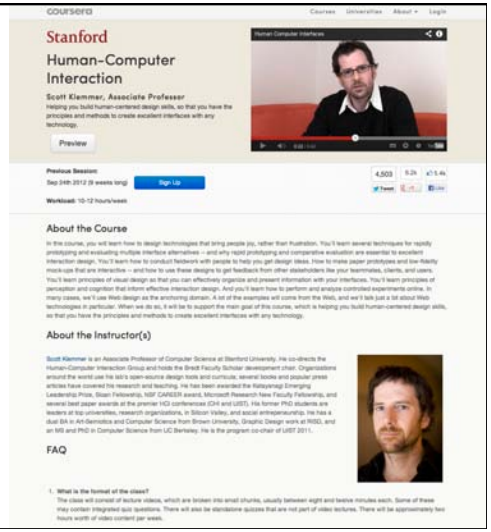
MOOC: Massive Open Online Courses

Artificial Intelligence researchers
- Teach a class via video and social media
  - 100,000 + students
  - peer tutoring
- How to handle grades?
- What about certification?

Future of education?

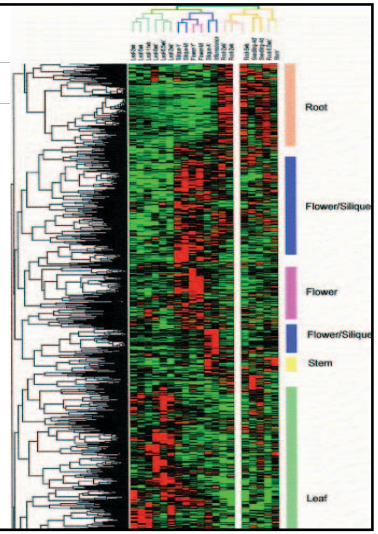
MOOCs

Massive
Open
On-line
Course

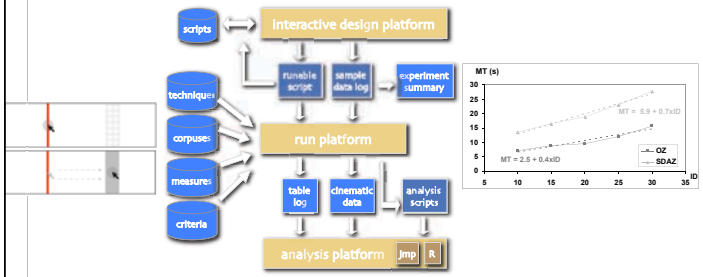


Global gene databases

Institut Pasteur –
How do you replicate an experiment if the comparison changes every few milliseconds?



Controlled laboratory studies



***Moving Targets*, Faure, Chapuis & Beaudoin-Lafon [Interact'09]**
***Touchstone*, Mackay, Appert, Beaudouin-Lafon, Chapuis, Du, Fekete & Guiard [CHI'07]**
***Orthozoom*, Appert & Fekete [CHI'06]**

Recent and current projects

Crisis management with Stanford Medical School
Bayscope and FabCoLab projects with Berkeley
Mass collaboration in Wikibooks
Privacy project with MIT

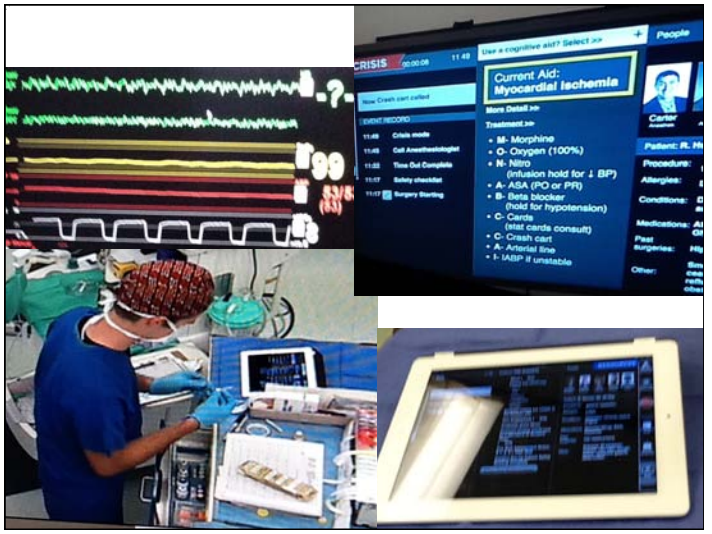
Stanford – Cognitive Aids in the Operating Room

Provide cognitive aids to doctors in crisis situations

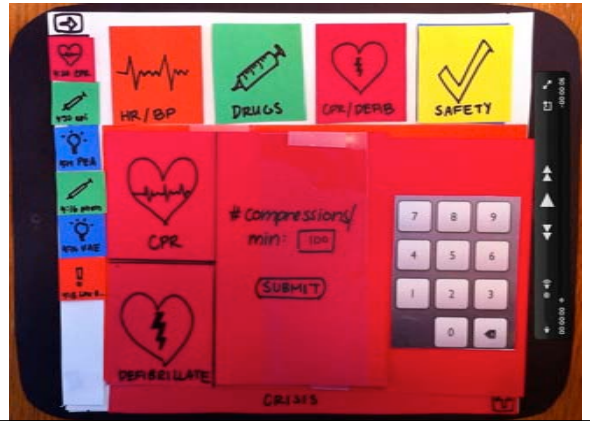
Observational studies and interviews in real operating rooms
Observational and controlled experiments in OR simulator
Participatory design workshops to create prototypes

Shift from "cognitive aids" and "checklists"
to resource management for people, data, processes

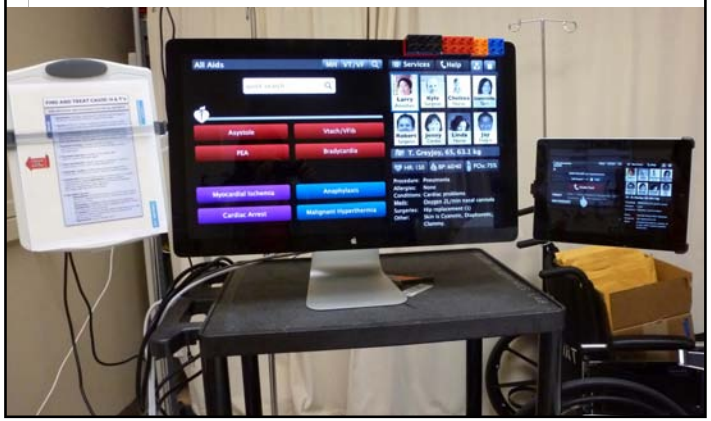
CURUS, 2011



Prototyping the screen

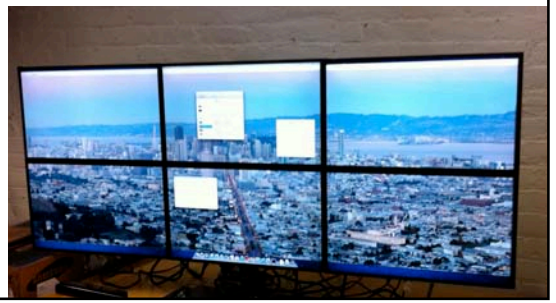


Prototyping the crash cart

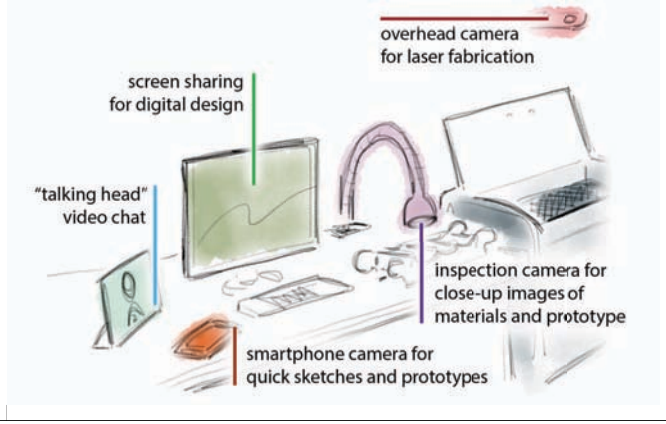


Berkeley Bayscope

BayScope: Converting collaborative software at a distance to collaborative software over space



Berkeley FabCoLab



Redundancy and Collaboration in Wikibooks

Wikibooks:
- Multi-year, collaborative book-writing projects
- May have 1000+ authors
- Some books are high-quality, others not

Research question:
- What is the role of redundancy in the collaboration process?

How can you study this?

Redundancy and Collaboration in Wikibooks

What is an appropriate measure of quality?
edits? authors? accuracy? credibility? legibility?

Need an independent measure of quality
Chose 59 "Featured" or high-quality wikibooks

What is an appropriate measure of collaboration?
Ho: Redundant text ~= communication breakdowns
or lack of coordination among participants

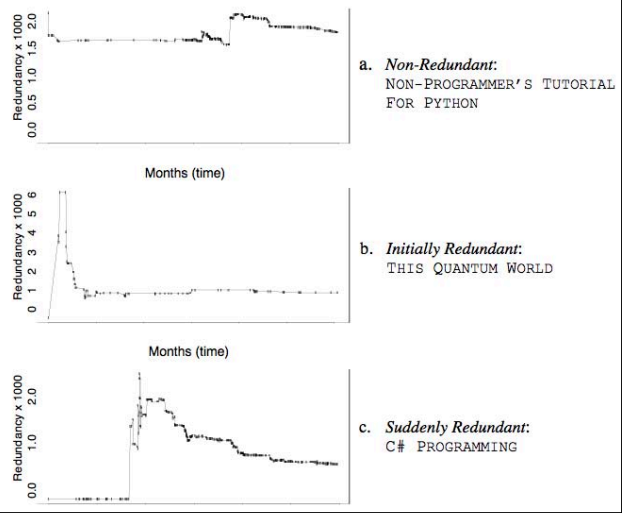
Redundancy and Collaboration in Wikibooks

Examined 51 book books from start to finish:

Non-Redundant books 14 / 51
rarely redundant

Initially Redundant books 23 / 51
initially redundant – then steady decline or rapid drop

Suddenly Redundant books 14 / 51
Initially redundant – then sharp increases followed by gradual decrease



a. *Non-Redundant*: NON-PROGRAMMER'S TUTORIAL FOR PYTHON

b. *Initially Redundant*: THIS QUANTUM WORLD

c. *Suddenly Redundant*: C# PROGRAMMING

Redundancy and Collaboration in Wikibooks

Examined 51 book books from 2003 – 2009
using semantic similarity: argument repetition

1. Redundancy is negatively correlated with quality:
   Non-Redundant books 14 / 51
   rarely redundant
   Initially Redundant books 23 / 51
   initially redundant – then steady decline or rapid drop
   Suddenly Redundant books 14 / 51
   Initially redundant – then sharp increases followed by gradual decrease
2. 50% of content is written by 2-3 authors
3. Use of collaborative tools is correlated with redundancy

Field studies

Field studies:	*Summative evaluation* of a prototype tested in a real-world setting
Measures:	Logs (keystroke, cinematic) Diary studies Debriefing interviews (preferences) Critical incident interruptions
Examples:	PageLinker, WM Lisa