

Evaluation

MILCs

Citation:

Strategies for Evaluating Information Visualization Tools:
Multi-dimensional In-depth Long-term Case Studies

Ben Shneiderman, Catherine Plaisant

BELIV, 2006, Venice Italy

Efficacy of tools can be assessed by documenting:

- 1) usage (observations, interviews, surveys, logging)
- 2) expert users' success in achieving their professional goals

Imagine MILCs being used by 3 - 10 researchers working over 1 - 3 years

Evaluation MILCs

Motivation

Movement from reductionist, tightly controlled lab conditions towards 'situated strategies that emphasize ethnographically-oriented and longitudinal participant observation'

MILCs suitable for studying creative activities of info viz system users

Multi-dimensional - observations, interviews, surveys, logging

In-Depth - intense engagement by researchers as partner

Long-term - from training to proficiency to strategy change

Case Studies - detailed reporting on a small number of users

Evaluation MILCs

Historical Overview

Francis Bacon + scientific method - small variables, keep CONSTANT!
Removed from practical, real-world problems and broader goals

Narrowly defined tasks - cognitive psychologists

1970's - human factors researchers for understanding human performance

Usability testing - typical tasks in labs - iterative, revisionary lab tests.
Moved to situated research with everyday tasks.

Action research (Lewin) - ways to change process, reflective progressive problem solving

Ethnographic methods and case studies (rival hypothesis proving)

Evaluation MILCs

Outcomes for MILCs

Researchers prepare a guiding set of research qtns to narrow their focus

Develop trust and rapport with the subjects

Gain entry, permission and participation

Discussion and commentary

1) Refinement of the tool and an understanding of the general principles for the design of such tools

2) Achievement of the expert users' goals by way of their use of the tool

Use some ethnographic methods for limited periods

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Guidelines for a valid ethnographic process:

Preparation

- Understand organization policies and work culture
- Set initial goals and questions
- Gain access and permission

Field Study

- Establish rapport with managers and users
- Observe or interview users in their workplace, collect qual. + quan. data
- Follow any leads
- Record visits

Analysis

- Compile and quantify data in numerical, textual and multimedia form
- Reduce + interpret data
- Refine the goals and the process used

Reporting

- Consider multiple audiences
- Prepare a report and present findings

Evaluation MILCs

Conducting MILCs of info viz systems

- 1) Specify your research questions and goals, keeping them focused on particular aspects of the tool and its use
- 2) Identify 3 - 5 users of varied expertise and goals. Can be a staggered start. Expect dropout and be flexible
- 3) Document the current tool being replaced/augmented by the new tool.
- 4) Determine the factors for professional success for the users
- 5) Establish a schedule of observations and interviews
- 6) Instrument the tool to record usage data - features explored, frequency etc.
- 7) Provide a log book to users for recording comments, problems
- 8) Provide training
- 9) Conducts visits and interviews
- 10) Encourage users to use the best possible tool for the task
- 11) Modify the tool as needed
- 12) Document success and failures

Evaluation

The Angel of Death

Citation:

Influences of Large-Scale Form on Continuous Ratings in Response to a Contemporary Piece in a Live Concert Setting

Stephen McAdams, Bradley Vines, Sandrine Vieillard, Bennett Smith, Roger Reynolds

Music Perception. Winter 2004, Vol 22, No 2, p 297 - 350

“..one wonders at times what the subjective reality of such forms might be if one takes into account human memory limitations”

The Angel of Death

for Piano Solo, Chamber Orchestra and Computer-Processed sound

Evaluation

The Angel of Death

Study

Long piece of especially composed contemporary music, created by Reynolds in interaction with psychologists

Experiments carried out in Europe and North America

Ecological validity using a continuous response method

Focused on two aspects of the listening experience:

- 1) sense of familiarity or resemblance of materials
- 2) emotional force felt by the listener

Measured through online response protocols

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Study

“The project raises questions concerning the nature of musical form, the role of familiarity and recognition of music listening, evolving musical emotions, and the analysis of all of them with continuous response data”

Evaluation

The Angel of Death

Form is the shape of experience through time and its resonating reminiscences

Familiarity + Recognition

Recognition of associations between original musical materials and variations or transformations of those materials during listening.

Musical Emotion

Characterizing emotions felt, identifying aspects of musical structure generating them, how they evolve over time

Time Series and Functional Data Analysis

Tracking devices(sliders, squeezers, pedals)

Reliability of the data - inferential statistics

FDA - Ramsay + Silverman - temporal response profiles

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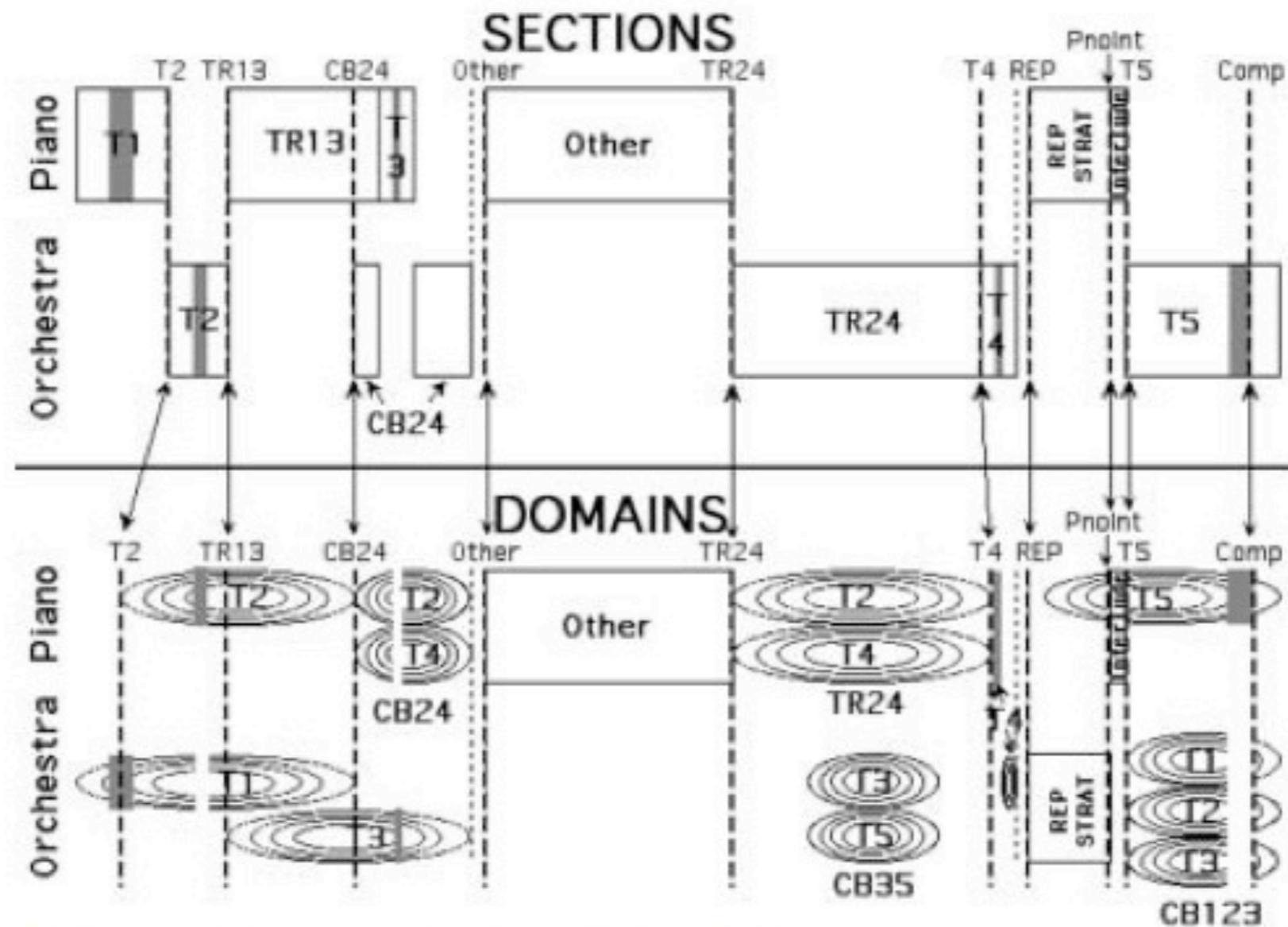


Fig. 1. Structure of the two parts (Sections and Domains) of *The Angel of Death* and structural boundaries (dashed vertical lines) used in statistical tests. (See Table 1 for the key to abbreviations.) Note that the Combination regions CB24, CB35, and CB123 in the D part are indicated by the superposition of the corresponding thematic materials. The latter two do not have analogues in the S part. Gray boxes indicate core elements of the themes. The labels for the structural boundaries just above the dotted lines are used in the text.

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The Angel of Death

S-D, or D-S, with computational music always in the second half

Composer conceived of S as more abrupt than D

Playing in different orders - how impact perception and emotion

Influence of computer layer on instrumental material

Two continuous rating scales

1) perception of musical materials and structure - purely memory at different levels of processing

2) listener's emotional responses - physiological, some memory, valence maybe - more likely arousal or activity level

more interested in evolution of emotion, rather than category

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Method

Performed twice - Pompidou Center (350, 2001) and UCSD(550, 2002)

Devices and questionnaires

Paris - 106 participants, free entrance
49 for familiarity and 57 for emotion

La Jolla - 99 participants, free entrance
46 for familiarity and 53 for emotion

not all completed for both pieces

musicians, amateur musicians, non-musicians - how many years
male, female

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The Angel of Death

Method

Response device, instruction sheet, biographical questionnaire, informed consent form and post questionnaire

Rate how familiar what they were hearing to what they had heard before

Rate the force of their emotions

Minimize use of don't know

Center of auditorium, spread out

Used system actively throughout the piece

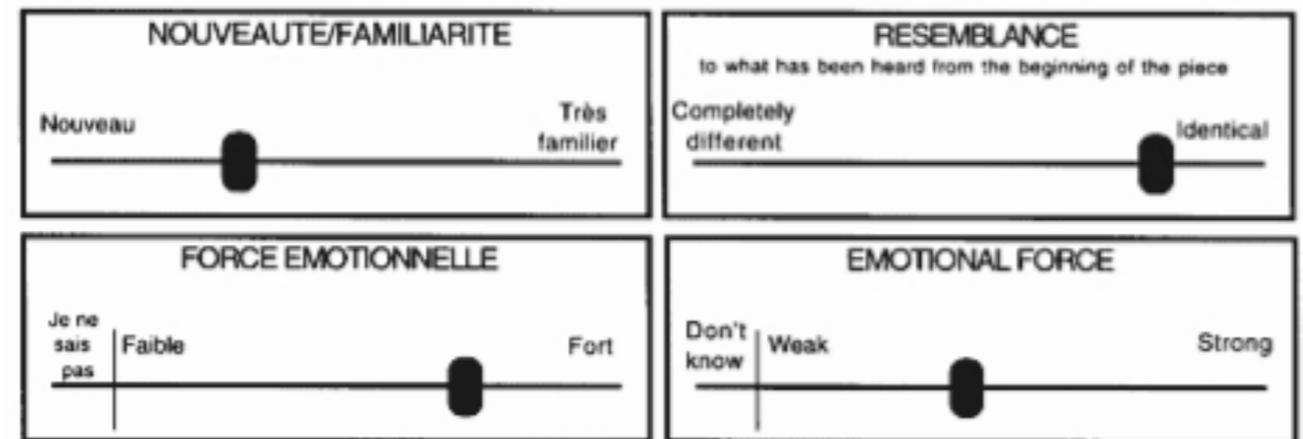


Fig. 2. Response box labels for the Paris (right) and La Jolla (left) concerts for the Familiarity or Resemblance scales (upper) and the Emotional Force scale (lower). The vertical line across the slider track in the Emotional Force scale indicates a slight resistance to passing into the "Don't know" zone.

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The Angel of Death

Summary of Main Findings - Familiarity

Global similarities between mean responses in both concerts
Sudden changes on boundaries
Greater ratings for second part
S section had strongest boundary detection

Summary of Main Findings - Emotion

Close resemblance of emotional force profiles across concerts
Collective emotional force profiles hierarchically nest

Emotional force - information rate, energy, spectral centroid

Transformation, not identification leads to emotion

Evaluation

Cognition in the Wild

Citation:

Distributed Cognition: Toward a New Foundation for Human-Computer Interaction Research

James Hollan, Edwin Hutchins and David Kirsh

ACM Transactions on Computer-Human Interaction, Vol. 7., No 2, June 2000 p 174 - 196

Distributed cognition is specifically tailored to understanding interactions among people and technologies

It seeks to understand the organization of cognitive systems

Beyond the individual to encompass interactions between people and with materials and resources in the environment

Evaluation

Cognition in the Wild

Principles:

- 1) Boundaries of the unit of analysis for cognition.
Delimited by the functional relationships among the participating elements
- 2) Range of mechanisms that may be assumed to participate

Cognitive processes may be distributed across the members of a social group

Cognitive processes may involve coordination between internal and external (material or environmental) structure

Processes may be distributed through time in such a way that the products of earlier events can transform the nature of later events

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Cognition in the Wild

Distributed Cognition Approach

- 1) Socially Distributed Cognition
Social organization as a form of cognitive architecture - through trajectories of information exchange
- 2) Embodied Cognition
Organization of mind is an emergent property of interactions among internal and external resources
- 3) Culture and Cognition
Culture emerges out of activity and in turn shapes it
Previous activity that enables problem solving

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Cognition in the Wild

Distributed Cognition Approach

- 4) Ethnography of Distributed Cognitive Systems
 - Meaning is situated in negotiated social practices
 - Includes silences and absence of action in context

 - Event-centered - what and how
 - Video and audio recording - some automated

 - Participant observation

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Cognition in the Wild

Framework for Research

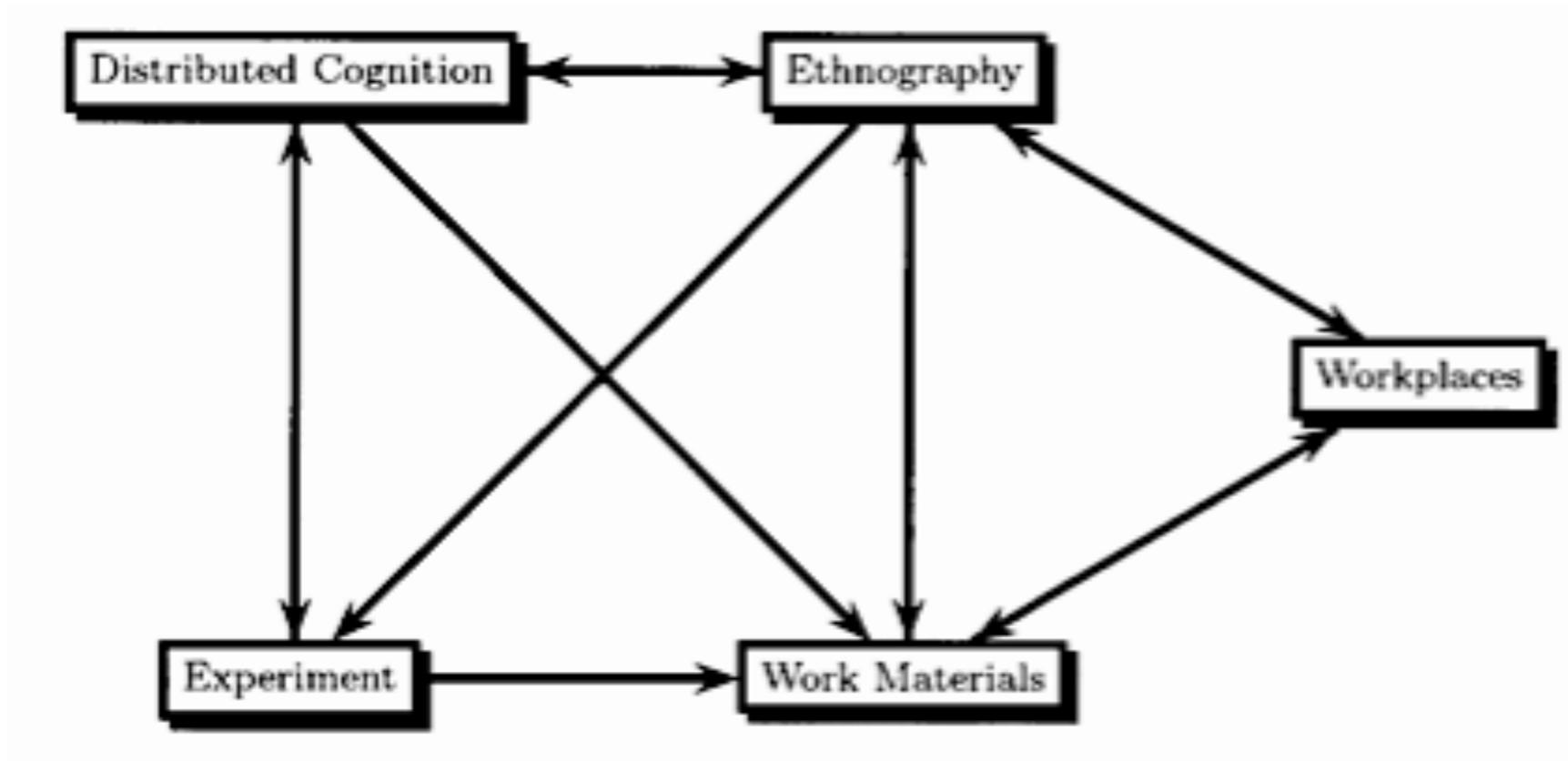


Fig. 1. Integrated research activity map.

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Distributed Cognition Approach

Examples - Ship Navigation, Airline Cockpit: tool use and social organization

Representations and direct-manipulations

Make them more active and relevant

Shift the frame of interpretation for better understanding

History-Enriched Digital Objects

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Cognition in the Wild

Distributed Cognition Approach

Intelligent Use of Space

Facing some direction, have certain objects in view, within reach of others

Well used space reduces the time and memory demands of tasks
Increases reliability of execution and number of jobs we can do

- 1) Spatial arrangements that simplify Choice
- 2) Spatial arrangements that simplify Perception
- 3) Spatial dynamics that simplify internal computation

Evaluation

Designing Interactions - Bill Moggridge

Creativity/ innovation

Aesthetics/ quality

Human Factors / values

Performance/ technology

Completeness/ presentation

p 651

<http://www.designinginteractions.com/book>



Evaluation

Designing Interactions - Bill Moggridge

Understanding Constraints

Ecology - the interdependence of living things

Anthropology - the human condition

Sociology - way people relate to one another

Psychology - way the mind works

Physiology - way the body works

Anthropometrics - sizes of people