An Inquiry Into Theory Use in HCI Research

Jordan Beck | August 17, 2017

Theory In HCI Research

1. how does theory “frame and/or fuel” the HCI research agenda?
2. what if technological artifacts embody theories?
3. what role (if any) ought theory play in research through design?
4. how might theory become more relevant and useful for practitioners?
5. **how do HCI researchers use theory in their publications?**

“...the use of theory in research is a hallmark of [a] discipline’s academic maturity”

(Pettigrew & McKechnie, 2001, p. 62)

“... disciplines require theories that originate from within to attain recognition as an **independent field** of scientific inquiry.”

(Pettigrew & McKechnie, 2001, p. 62)

“human–computer interaction will for some time be in its early days”

(Grudin, 2012, p.34)

HCI could be framed as an adolescent discipline.

(Rogers, 2012)

“The field of human-computer interaction is **bursting at its seams**” (Rogers, 2004, p.38)

HCI might be heading towards an **identity crisis**. (Rogers, 2012)

Studying theory use is one way to assess **maturity** and **identity**.

The Research Problem

Studying theory use with textual analytic techniques faces important limitations.

Research Questions

Research Question 1

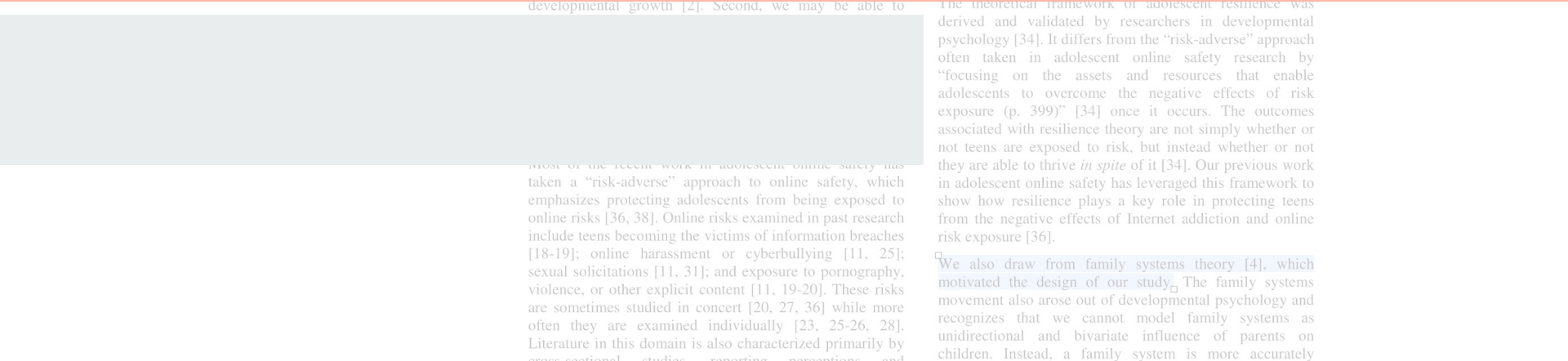
What are the limitations of studying publications in an effort to understand theory use in HCI research?

Research Question 2

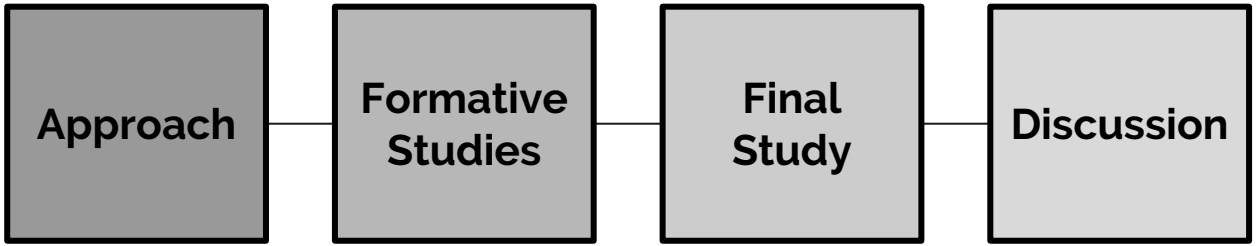
How might visual models enhance research on theory use in HCI?

Research Question 3

Should HCI researchers take steps to clarify theory use in their scholarly writing?



Structure of Presentation



Research Approach

Methodologies

conceptual

d + a - rm

qualitative

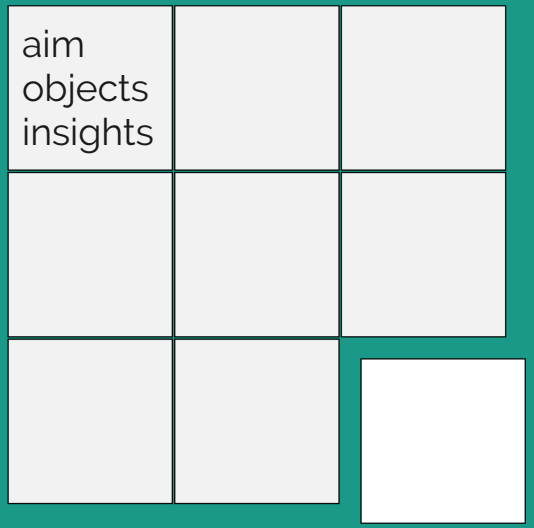
Methods

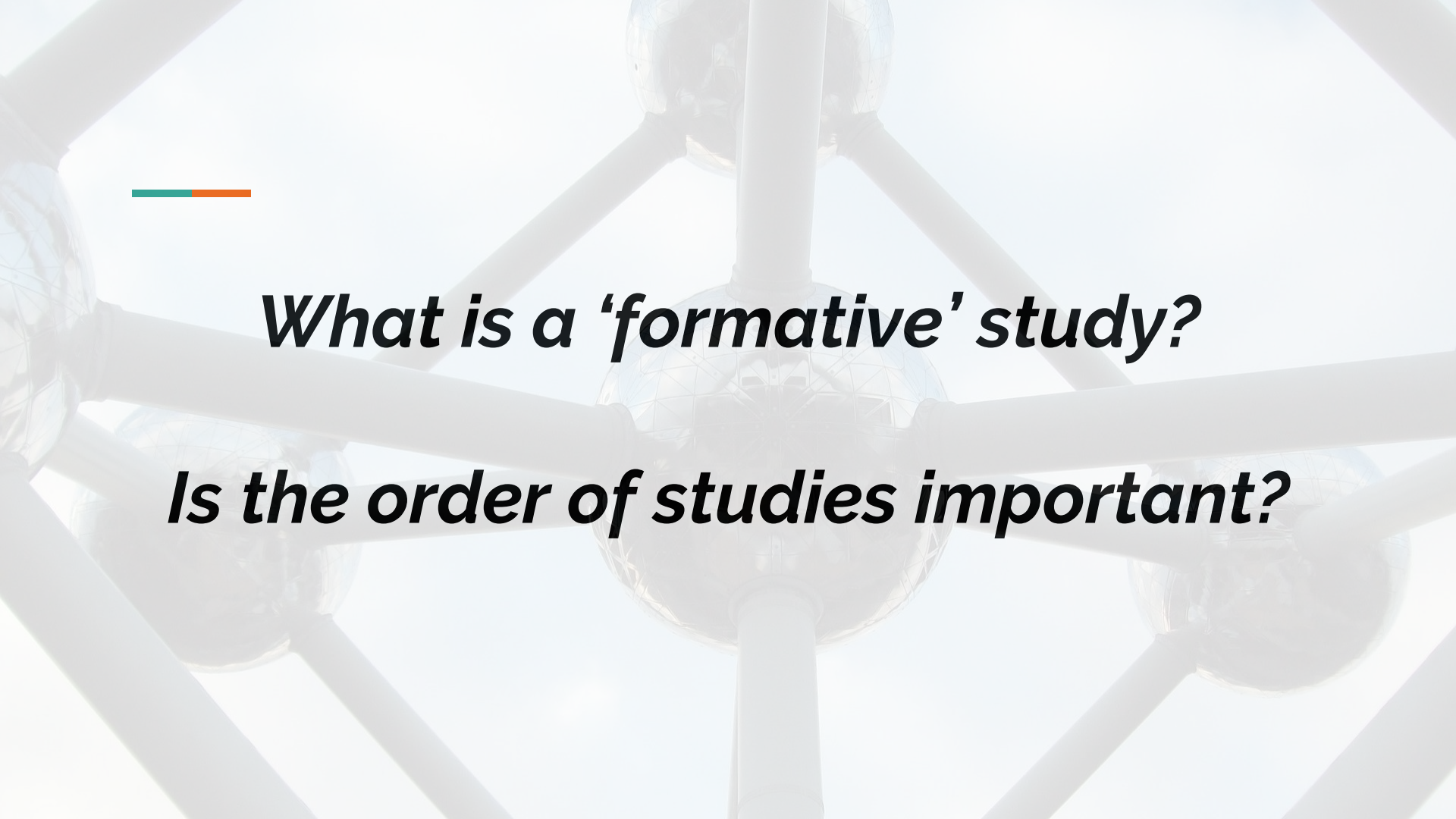
artifact analysis (6)

essay (2)

lit review (1)

Formative Studies





What is a 'formative' study?

Is the order of studies important?

Scientific Theories of Design

Aim. Can there be scientific theories of design that do not scientize design?

Objects: CK Theory, FBS Framework, Bounded Rationality, Figural Complexity

Insights: Some design theories can be scientific. Design has no *given* problem, no *given* process, and no *given* solution.

Examining Practical, Everyday Theory Use in Design Research

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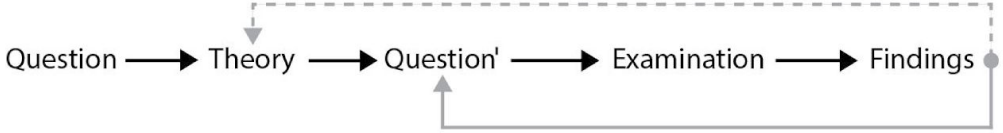
Aim. Understand how theories are used in design research publications with ideas from grounded theory + content analytic techniques

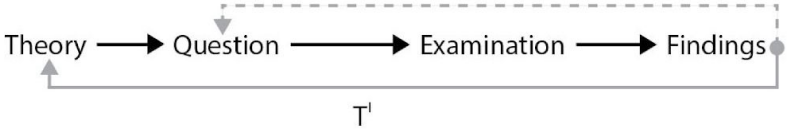
Objects: 32 journal articles published in *Design Studies*

Insights: Six models of theory use

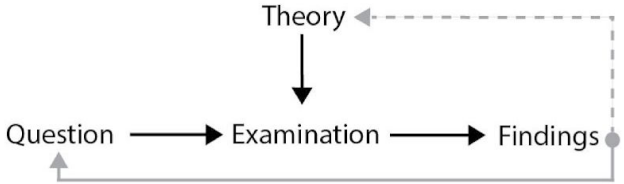
(0) No theory



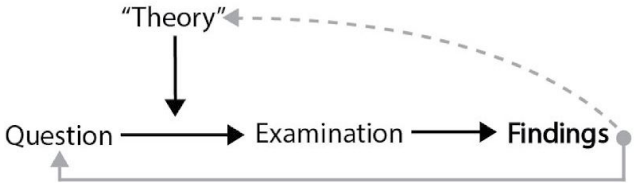
(3) Theory as a shaping tool



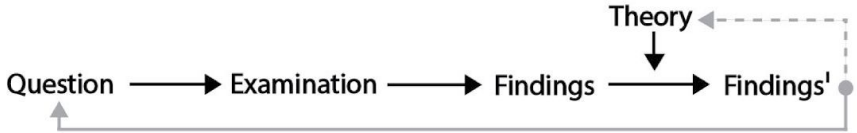
(1) Theory as the object of study



(4) Theory as a methodological tool



(2) Theory as a contextual tool



(5) Theory as an analytical tool

Six models of theory use in design research publications

Studying Theory Use in HCI Research Publications (unpublished)

Aim. Examine the utility of the models as an analytical framework *and* shift focus to theory use in HCI research publications.

Objects: 35 randomly sampled full papers from CHI2015

Insights: Patterns of theory use in HCI and design research. Models as useful tools.

Examining Contemporary Citation Practices in DRS Publications

Aim. Understand how and why scholars publishing papers at the DRS conference cite the work of Donald Schön.

Objects: 299 citations across 120 texts published at four DRS conferences (2010-2016)

Insights: Most scholars credit Schön for ideas or to justify their work. Few engage critically or build on his scholarship.

DESIGN FOR NEXT
EAD12-ROME

Why aren't there more scientific theories about designing?

Aim: Speculate as to why there seem to be fewer theories about designing achieving (or aspiring to achieve) scientific status.

Objects: 100+ theories, models, and frameworks describing the design process.

Insights: Value of scientific theory. Unique intellectual culture. Multiple ways to distinguish scientific theories.

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Examining the Types of Knowledge Claims Made in Design Research

Aim: Explore knowledge claims as means to distinguish research communities from one another.

Objects: 30 articles from *Nature*, the *American Sociological Review*, and *Design Studies*.

Insights: Knowledge claims show promise as a means to distinguish design research from other intellectual communities.

Reviewing the Big Questions Literature; or, Should HCI Have Big Questions?

Aim. Understand what big questions (**bq**) are and why scholars propose and argue for them in different research communities.

Objects: 71 publications

Insights: bq are resource intensive or impactful. Scholars argue for **bq** in in terms of fragmentation, status, and progress.

The Theory-Practice Gap as Generative Metaphor (unpublished)

Aim: Argue for an interpretation of the theory-practice gap in HCI research as a generative metaphor. Emphasize problem-setting approach.

Objects: (1) The Theory-Practice Gap, (2) Generative Metaphor

Insights: Very little assessment of success/failure of “bridges.” Possibility of exploring new metaphors.

Overall Insights from Formative Studies

Insight 1. Different interpretations of theory may yield different insights about theory use.

Scientific theories of designing

Why aren't there more scientific theories about designing?

Examining practical, everyday theory use in design research

Examining the types of knowledge claims made in design research

Reviewing the big questions literature; or, should HCI have big questions?

Insight 2. Theory as an object in scholarly writing may have a variety of functions.

Can there be scientific theories of design that do not scientize design?

Examining practical, everyday theory use in design research

Studying theory use in HCI research publications

Schon's intellectual legacy: a citation analysis of drs publications (2010-2016)

Examining practical, everyday theory use in design research

Studying theory use in HCI research publications

Insight 3. Visual models of theory use in scholarly writing may be useful for studying theory use *and* writing manuscripts.

Insight 4. The problem of theory use is constructed. It can be reframed.

Reviewing the big questions literature; or, should HCI have big questions?

The theory-practice gap as generative metaphor

Insight 5. How scholars go about studying theory use is an interesting and important topic of study.

Examining practical, everyday theory use in design research

Studying theory use in HCI research publications

Schon's intellectual legacy: a citation analysis of drs publications (2010-2016)

Final Study

Examining Theory Use in CHI Best Paper Winners

Context

CHI is the flagship HCI conference

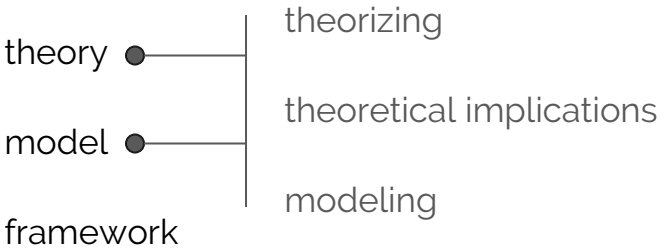
2300+ submissions | 23.4% acceptance rate | 23 best papers **(2016)**

Lauded papers serve as exemplars for other researchers

90 best papers (2012-2016)

Stage 1

KEYWORD SEARCH



"There have also been attempts to automatically decompose color spaces [**15,** 22, 1] into named regions…"

[15] Computational **Model** of Color Perception

"Much of the discussion… has turned towards phenomenology [7] and ecological psychology [24]… These theories provide ways of understanding…

Fernaeus, Jonsson, & Tholander, 2012, p. 1598

100+ unique instances of theory

Model of Interruption
Information Foraging Theory
Optimal Foraging Theory
Fitts' Law
Model of User Burden
Modified Reuse Model
Color Perception Model
PACE Model
Gaze Model
BerkeleyLM*
Social Learning Theory
Grounded Theory
Affordance
Animated Objects
The LemonAid Framework*
Memory-for-Problem-States
Stereotype Model
Balance Model
Model of Adolescent Resilience
Foreground-background Framework
Model of Open Innovation
Product Ecology Framework
Family Systems Theory
Technology Acceptance Model
Duality of Technology
Model of Adaptive Thermal Comfort
Self-regulation Theory
Social Cognitive Theory
Value Sensitive Design
Attention Investment Theory
A Biomechanical Model of the Arm
Value of Social Networking Model
Cognitive Models of Visual Search
Model of Tie Strength / Site Use
Goffman's Theatrical Metaphor
Hogan's Exhibition Approach
Infinite Monkey Theorem
Panopticon*
The AMT Model
Model of Crowdsourcing
Theories of Social Change
Meter-based Charging Model
Color Subjective Response Model
Critical Theory
Behavioral Theory
Social Cognitive Theory
The Health Belief Model
Self-efficacy Theory
Theory of Planned Behavior
Self-determination Theory
Goal-setting Theory
Theory of Sensemaking
New Mixed Effects Model
Dynamic Energy Model
Static Model of Perceptual Area
Dynamic Model of Perception
Extended Model of Subject Response
Search, Decision, Pointing Model
Predictive Model of Scrolling
Predictive Model of Menus
Ecological Theory of Perception
Activity Theory
Framework for Viewing Digital Info
Tangible Interaction Framework
Phenomenology*
Ecological Psychology*
Rhythmic Interaction Framework
Ethical Framework for Uncomfortable IX
Protection Motivation Theory
Social Translucence Theory
Item Response Theory
Reality Model
Balance Model
Uncertain Input Framework
Theory of Variable Foraging
Partially Understood Input

Analysis Stage 2. Applying models

Theory as an Object of Study. the question is about the theory. theory drives the question

One proposal for such a theory is Altmann & Trafton's **Memory for Goals theory** [2]. Memory-for-goals assumes that each task has an associated task goal with a certain activation level. When a primary task is interrupted, its goal is stored in declarative memory… Memory-for-goals theory made the prediction that longer interruptions lead to longer resumption processes, which was confirmed by several studies [23,34,35,45]. However, other interruption effects cannot be easily explained within **memory-for-goals theory**.

In the current paper **we will extend memory-for-goals** and its explanatory power – by not focusing on task goals per se, but on the contents of the problem state associated with each task.

Borst, Taatgen, & van Rijn, 2015 p.2971

Analysis Stage 2. Applying models

Theory as an Methodological Tool. theory shapes the examination stage

We also draw from **family systems theory [4]**, which motivated the design of our study. The family systems movement also arose out of developmental psychology and recognizes that we cannot model family systems as unidirectional and bivariate influence of parents on children. Instead, a family system is more accurately portrayed as a dynamic process where parents and children are iteratively and bidirectionally influencing one another over time [4]. Family systems research is comprised of an emerging set of methods for studying families as a system.

Wisniewski et al., 2016, p. 3920

Outcomes

Object of Study	46
Shaping Tool	00
Contextual Tool	47
Analytical Tool	12
Methodological Tool	23
No Theory	7

Possible HCI Theories

User Interface Model

Touch Input Framework

Time-based UX Framework

Reality-based Interaction

Cross-divide Interaction

Partially Understood Input

GOMS

Foreground-background Framework

Fitts' Law

Model Human Processor

Search, Decision, Pointing Model

Predictive Model of Scrolling

Predictive Model of Menu Performance

Tangible Interaction Framework

Rhythmic Interaction Framework

Ethical Framework for Uncomfortable IxD

Uncertain Input Framework

Examining the models

built-in biases towards scientific theor*ies*

utility and value of the model of **Theory as a Shaping tool**

emphasis on explicit theory use

Discussion

It is possible to study theory use by analyzing scholarly publications.

Achterberg & Clark (1992), Alley et al. (2010), Arts (2010), Beck & Stolterman (2016), Chong & Xie (2011), Clemmensen, Nardi, & Kaptelinin (2016), Colquhoun et al., (2013), Hannay et al. (2007), Hall et al. (2009), Hawley & Geske (2000), Hekler et al. (2013), Kim & Jeong (2006), McKechnie & Pettigrew (2002), Painter et al. (2008), Pettigrew & McKechnie (2001), Pitt et al. (2005), Scheerens (2015), Schiller & Mandviwalla (2007), Velt, Benford, & Reeves (2017), Weerakkody, Dwivedi, & Irani (2009), Weis (1998), Wu & Volker (2009)

1) what counts as theory?
2) what if there are no explicit mentions?
3) what about artifacts?

Modeling Theory Use

explore the possibility that the location of theory is meaningful

promote reflection on research outcomes and core elements of texts

support researchers evaluating or preparing manuscripts

Adapting Research

approaches can evolve and adapt to meet the needs of a diverse research community

Reframing HCI Research

diversity | exploration | adolescence

Thank you!