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Declaration

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Navigating Indeterminacy through the application of User Journeys

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Abstract
Of the defining characteristics of indeterminate problems, the presence of overwhelming amounts of data presents one of the largest challenges to the designer. The complexity presented in understanding, managing and using data as it is discovered, aggregated, mapped, organized, interpreted, synthesized and transformed through human-centered design processes, in the context of the environment of the problem-ecology, requires that the designer has tools that can assist with designing solutions from these large bodies of data. User journeys have become a frequently applied tool for research and design in the practical fields of Design Thinking, Service Design, User Experience Design and Information Architecture Design. In our paper we reposition User Journey Design as both a tool and a rigorous self-reflective, data-driven process through information gathering, synthesis and into design, which assists the designer in navigating the complexities of indeterminate problems.

Keywords: Design cognition, User Journeys, complexity, indeterminacy, data and information, analysis and synthesis.

Introduction
The proliferation of indeterminate problems in a world of increasing complexity, not least within developing contexts, can place new demands on stakeholders, educators, students, design practitioners and theorists. In this new paradigm, our experience has revealed that bridging the spaces of education, practice and theory is rich with opportunity but lacks in approaches that tangibly assist in bringing these worlds closer together. User journeys\(^3\) provide a structured approach to synthesizing large amounts of data in self-reflective, humanistic ways, where the path through complexity can be traced back from artifact to the original problem-formation. It is in this respect that user journeys, as a design tool, not only provide an approach to

\(^3\) In this paper we will use the term ‘user journeys’ as an umbrella term for User Journeys which tend to be applied in the design of digital spaces, as well as Customer Journeys, Customer Journey Maps and Customer Experience Maps which are more frequently applied in the spaces of Service Design and related cross-channel or channel neutral design practices.
solving problems that emerge through complexity, but also narrow the gap between practice, research and teaching by making the hidden visible.

This paper will present a history and review of the literature and application of user journeys in practice today. We will then explore related literature from Design Thinking, in particular the literature concerning the nature of indeterminacy, to set the context for an approach that broadens the relevance and application of user journeys. To this end a case study will be presented that demonstrably positions user journeys as a bridge between education, theory and practice as the designer navigates complexity in a self reflective, data-driven, human-centered process.

User Journeys

User journeys have been applied extensively in the field of information architecture design over the past decade with specific reference to the evaluation, research and design of digital experiences (in particular website design)\(^4\). In our experience, the emergence of user journeys can be viewed as a merging of business process design, customer relationship management (and the use of relationship and engagement models or cycles) and user-centered design (empathetic explorations of the user’s experience, needs-based design and the use of interaction models).

More recently, the rise of human-centered design methods taking root in businesses (Brown, 2008), multi-channel integration and cross-channel design (Resmini, 2011), and Service Dominant Logic, in the form of Service Design (Lusch & Vargo, 2006), have extended the user journey focus to include the full business value-chain, user experiences that span channels and business unit remits, and an interest in the total service ecology within which users operate (Browne, 2011). The associated design artifact became known as Customer Journey Maps.

A user journey is a schematic representation of the path a user will take through lifecycle stages (usually derived from relationship, engagement or interaction models), channels, touchpoints, content and functionality, demonstrating related factors such as the emotional state of the user, interaction modes\(^5\), key marketing messages, micro barriers and breakpoints (drop-off) along the way.

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\(^4\) See Caddick & Cable, 2011: 78 for an in-depth practice orientated account of user journey design

\(^5\) As users progress through journeys their modes typically change, for example from information gathering, to making choices and narrowing decisions, to fine-tuning, customizing and personalising
As a tool, journeys are useful in the information gathering or ‘discovery’ phase when used to describe current or ‘as-is’ paths taken by users. These journeys highlight both problems experienced by users and successful moments in the experience. To create ‘as-is’ journeys the designer can personally emulate the experience, shadow users, ask users to describe the experience, gather analytics to reveal journeys, amongst many other techniques.

Journeys can also be integrated with other user-centered design tools, such as personas, to add increased levels of detail when considering experiences through the multiple lenses of user role or types as presented in Figure 2 below.
In the design phase, an ideal user experience will be conceived and presented as a mapping of discrete interactions across environments and time through which users are intended to travel. Individual interactions are linked together and highlight the options available to users through the journey often employing hooks\textsuperscript{6} to ensure that users remain in the journey (i.e. so as not to drop-off) and are compelled to continue. Ideally, designed journeys are needs-based (Hobbs, 2005) and provide logical progressions such that users are provided a sense of orientation across time and channels (where they have come from, where they are and what their next steps or options are, are explicit in the interaction).

Additionally, designers will seek to ensure that across interactions and stages in the journey user needs are married harmoniously to the needs of the business or organization. This is an important and implicit consequence of the fundamental principles of Service Dominant Logic and Service Design\textsuperscript{7} as it organically removes barriers where customers would otherwise require persuasion to continue along a specific path or to customers making certain decisions.

\textsuperscript{6} Techniques are varied but by way of example hooks can range from special offers, to actionable content that progresses a user to a next step or items of content aimed at addressing barriers to continuing commonly experienced by users at that point in the journey.

\textsuperscript{7} This point is the author’s interpretation of the eight fundamental principles of Service-Dominant Logic, that is, the designers aim of architecting systems that provide meaningful value-exchanges between all participants in a particular ecosystem. (Sharpe, 2006)
As previously noted, user journeys operate alongside other tools commonly employed in service, user experience and information architecture design as well as marketing and IT. By way of example, a generic commercially oriented relationship model with four lifecycle phases is presented below:

**Figure 3. An illustration of a generic commercially oriented relationship model (Hobbs & Fenn)**

![Figure 3: An illustration of a generic commercially oriented relationship model (Hobbs & Fenn)](image)

Each lifecycle phase would have an associated journey: the pre-purchase journey, the purchase journey, and so on. Each of these journeys would demonstrate how various scenarios link together to form a time-based progression through the relationship model.

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8 Scenarios are a technique applied in human centered design to 'tell the story' of an interaction at a low level of detail and thus simply and succinctly communicating the most important aspects of a designed experience. By way of example, comic strips are often used as a means of communicating a scenario.
Scenarios along a journey will reflect the changing needs, need-states, modes and emotions of users and the choice, order and linkage of scenarios (the structure of the journey) by understanding both the types of users engaged with the system and business needs and rules along the way.

As portrayed in Figure 4, at the level of the user journey artifact, scenarios are generalized. The illustration presents three important aspects of integrating user journeys into the design process. One, that user journeys are based on models derived from research. Two, that the model sets the logic for multiple scenarios to be linked across various user journeys that too are linked that together constitute a description of a new system of experience and interaction. And three that at different stages in the design process artifacts reflect deepening level of detail in describing the experiences. For example, the journey will not describe all the possible detail in a log in scenario, just that a log-in is required at this stage in the journey. Instead, storyboards, prototypes, task flows, process diagrams and use cases will be written to convey the detail of the log-in scenario referencing back to that moment in the user journey.

Figure 5. This illustration presents the changing levels of detail that the designer engages with at different stages in the design process. (Hobbs & Fenn)
Based on the application of the (relationship, interaction or other) model applied initially, the effectiveness of the eventual design of artifacts within each scenario is judged by its success in assisting users to move positively through that particular moment in the journey and can be tested against users representative of the aforementioned personas and measured through analytics or related key performance indicators.

User journeys tend to focus on the broader system or service environment experienced by the user and thus act as a tool to synthesise multiple data points, types of users and the interests of various stakeholders (for example in a commercial scenario: marketers, sales teams, operations, IT and product managers). Stepping into this broader system or service environment means that the design problem becomes situated in contexts-of-use (or contexts - of - experience), that is, society as influenced by factors such as economics, politics, culture, technology, etc.

As an approach, this is in line with an understanding of the role of design as shifting away from aesthetics and product towards a framing within transdisciplinary problem solving that effectively, empathetically and sustainably seeks to improve the life experience of people.

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Even when a specific product is present, the journey will explore the larger context in which the product operates (when applied specifically to the understanding or design of a product, journeys - in the definition presented in this paper - will usually be replaced by interaction models that deal with the user’s experience of the product specifically).
Indeterminacy and the Principle of the Included Middle

Design, when enacted within the polarities of complexity and indeterminacy shares with Transdisciplinary Research many cognitive similarities (Fenn & Hobbs: 2012). These similarities include the integration of knowledge and methods in the act of problem solving (Jahn et al, 2011: 2) and the intentional inclusion of stakeholders in the definition of problems (Jahn et al, 2011: 2, Wickson et al, 2005: 1048). However the area of Transdisciplinary Research that in our opinion best describes the dilemmas of complexity that confront the designer is Basarab Nicolescu’s Principle of the Included Middle (1984: 6, & in Max-Neef, 2005: 10). However in order to contextualise the relationship between Transdisciplinary Research and Design, the following section will provide a short description of a range of characteristics resulting from complexity, that can affect design practice.

Complexity can be understood as occurring when the following conditions are present (Johnson: 2007) in a system:

- A range of interacting objects or agents
- Objects or agents who’s behavior is affected by memory or feedback
- Objects or agents that adapt their strategies according to their history
- Systems are typically open
- Phenomena emerge which are generally surprising and may be extreme
- Phenomena emerge that typically arise in the absence of an "invisible hand" or central controller
- Systems present a complicated mix of ordered and disordered behavior

In summary, complexity can be said to occur within a system when the system’s elements and structures cannot be simulated nor easily predicated and thus present unexpected and unanticipated behavior (Rosen, in Resmini & Rosati 2011: 61). Klaus Krippendorff suggests in *Design Research: an Oxymoron* (2007), that design is inherently a social activity and thus in order to produce meaningful solutions, a designer must acknowledge and support peoples conceptions and desire and this requires listening, observing and collaborating so as to understand how people “think and justify their actions in worlds they always are in the process of constructing” (Krippendorff, 2007: 71-72). Regardless of the mode and technique the outcome of a rigorous research exploration into social reality is complexity, as social reality is inexhaustibly intricate and matches Johnson’s criteria for complexity (2007).

Complexity impacts on design in two distinct ways. Firstly, it can be understood as the context from which the problem emerges and secondly, as the context that provides the relational logic that the solution must acknowledge. At its most tangible, the complexity takes the form of the data generated by the research. It is therefore, the designer’s purpose to create clarity, that is, the aspect of the design that users will interface with, from the complexity of the resultant data.
Indeterminacy arises when design problems, situated in social complexities are characterized as being ill defined, reliant on subjective social agreement and wicked in the sense that before they can be solved they need to be tamed, defined and limited (Rittel & Webber: 156). Johann van der Merwe in a *Natural Death is Announced* (2010:1) describes design as a discipline-neutral groundless field of knowledge that constantly sources knowledge, skills, practices and contexts from other fields of knowledge as dictated by the location of the ‘specific design problem’ (2010:8). Van der Merwe’s (2010) observation implies that design solutions are in their own manner as indeterminate as design problems and contain no natural form or structure and are always acts of synthetic construction.

Both Richard Buchanan (1992) and Nigel Cross (1992:12) also warn against the temptation of applying premeditated and assumptive design solutions to complex problems. Buchanan (1992:10) describes the results of this dependence as “mannered imitations of an earlier invention” that are may no longer be relevant to the specific possibilities of a new situation.

The act of designing in response to complex problems is therefore one of bespoke construction. Rittel and Webber (1973: 161) emphasise the relationship of understanding the contexts of design problems and the formation of a design solutions and describe the requirements of design problem solving as follows: “One cannot understand the problem without knowing about its context; one cannot meaningfully search for information without the orientation of a solution concept; one cannot first understand, then solve."

The formulation of matching problem-solutions is a cognitive process that creates design solutions by iteratively reducing the range of relevancy though analysis while simultaneously forming meaning (the solution) through synthetic construction. This cognitive of synthesis is often described in contemporary models of the design process as ‘ideation’ (see Figure 6) but due to its iterative nature can be described equally as the problem / solution ecology.

**Figure 6: Basic Design Thinking process. (Harris & Ambrose, 2009). Another example would be the IDEO methodology (Brown, 2009)**

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11 or ‘categorical’ solutions as Buchanan terms them
The concept of a problem / solution ecology evokes for us the Principle of the Included Middle which, according to Max-Neef, allows “through an iterative process” to cross different areas of knowledge in a coherent manner, and thus generate a “new simplicity” (Max-Neef 2005: 13).

The Principle of the Included Middle when adapted to describe design cognition explains the cognitive jump that designers make when synthesising design solutions from design research so that the solutions will be accessible and useful to the end-users. This ability of the individual (researcher or practitioner) to fuse knowledge from a number of different disciplines and engage with stakeholders in the process of generating knowledge” (Wickson, et al 2006: 1051) is according to Jahn et al (2011: 3), the major cognitive challenge of transdisciplinary research, and we would argue, of design to.

The Included Middle can therefore be considered as descriptive of the site of the cognitive decision-making that precedes, identifies, selects and orientates the specific design disciplinary practices that construct the final solution. In the rest of this paper we will appropriate the term ‘the Included Middle’ and refer to it as ‘Design’s Included Middle’, to describe this area of synthetic cognition.

**User journeys and the Golden Thread**

As the designer moves through the design process (note that this is not linear) data both transforms and stands to degrade. It is of necessity that data transforms as the sheer mass of it requires not only re-organisation (through the use of models inherent in user journeys) but also re-interpretation either implicitly (because of the ‘nature’ of the model) or explicitly (through experience strategies). The cognitive resolution of Design’s Included Middle through the synthetic composition of meaning is contained within the user journey. Thus user journeys help to structure the thinking required for solving the complexity of the problem / solution ecology.

As previously noted, this is achieved by basing user journeys on the large mass of data derived through research which is organized into a coherent user experience by applying models that allow for the synthesis of user needs and modes, business needs, contextual requirements, channels, content and functionality, etc.

User journeys present the output of synthetic cognition, represented in diagrammatic plans that are then translated by other design disciplines or developers into final design artifacts with which users interact. User journeys are the information architecture, the blueprints, that represent the re-organisation and re-interpretation of data discovered through research and that act as the basis for design artifacts that will emerge from the blueprints.
Thus, in addition to serving the function of synthesis tool, user journeys also become the map through which the life of the data can be traced back from final designed artifact to the original Discovery phase and problem-ecology. This traceability we refer to as the “Golden thread” and it provides explicit evidence of the transformation of data that allows the design process to be both validated and self-reflective.

Figure 7. Above we illustrate the intersection of Design’s Included Middle and the Golden Thread where user journeys capture the moment of data transformation and traceability through the process. (Hobbs & Fenn)

Figure 8. This illustration provides greater detail than Figure 7 demonstrating, in principle, the design process and the transformation and traceability of data back from final designed artifact. Here, research data (1, 2, 3, 4, etc.) transforms at the point of solution where 1 + 2 = A, 2 + 4 = B, and so on. (Hobbs & Fenn)

Furthermore, in being self-reflective and as we will now demonstrate, the user journey provides for the theory of the solution to be revealed, discussed, shared, critiqued and tested and in so doing becomes available as a tool for educating others and either continued or related development of practice.\(^{12}\)

\(^{12}\)At the 2012 Pervasive Conference in Newcastle, UK (as part of the “Pervasive Information Architectures as Architectures of Meaning for Complex Cross-channel Systems” workshop organized by A. Resmini, J. Hobbs and T. Fenn) Damjan Obal contributed the paper “Jam me a service: Designing a cross-channel experience”. In the paper he presents a case-study where he demonstrates the value of information architecture tools for synthesizing data, making sense of the design thinking process, as bridge between team members from disparate
Case study: The research / discovery phase

The design work lead and managed by Hobbs while consulting to an international private bank over a three year period serves to demonstrate the points made above. Early in 2010 the brief to redesign the Bank’s online and mobile banking channels for the South African market was immediately broadened to understand the problem in the context of: other channels used by the Bank and experienced by their clients (the private banker, call centre, branch network, etc); the services of their other business units (covering wealth management and a variety of investment services) and international jurisdictions; and the broader ecology experienced by their clients (their contexts of use, needs, wants and desires, the competitor landscape, local and global finance and economy landscape, the influence of technology, etc).

Specific research activities to understand the problem ecology included: internal stakeholder interviews, 150 qualitative client interviews, an online survey, client feedback received through the online, call centre and private banker channels, behavioural analytics derived from the incumbent online and mobile banking channels, cross-sector best practice based on user interaction modes common in banking, best practice from the digital and IT sectors at large and within banking (including retail banking), business requirements gathering, competitor landscaping and a graphical discovery.

Naturally this amount of research generated an enormous amount of data (the consolidated list of requirements delivered 1669 unique items alone). It was therefore necessary to organize the data such that the problem ecology could be understood and so the team followed a process where insights and requirements were mapped to user interaction modes and grouped into themes. A few examples of the user interaction modes were information seeking, monitoring and advice seeking.

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disciplines and communicating and discussing ideas. His paper is due to published in the Journal of Information Architecture later this year.
Figure 9. This image illustrates various sources of data (in the outer ring) being mapped into themes (the middle ring) and finally into user modes (the inner circle). (Hobbs & Fenn)

Case study: The synthesis / strategy phase
Sixteen design principles and four data-driven personas were developed that would both inform the user experience strategy for the digital channels and act as tools to validate designs and manage conflicts and trade-offs\(^\text{13}\) that would threaten to emerge later in the process.

\(^{13}\) In the experience of the authors as practicing designers, complex problem ecologies present contradictions, conflicts and paradoxes largely because of the multiple stakeholders and users present in the ecology. Objectives, needs and experiences amongst these groups will often result in conflicting solutions and a common means of organisations navigating these conflicts is through trade-offs.
User journeys were then designed to describe the way in which users should experience content and functionality across time in the online and mobile banking channels such that the user experience strategy would be tangibly brought to life. In this design project the model applied for the journeys was embedded in the user experience strategy.

Managing the transformation of data through this process, ensuring that key aspects of data are not 'lost along the way' and that there is traceability back to previous iterations of the problem / solution ecology are what we are referring to as the Golden Thread that exists in Designs Included Middle.
As illustrated in Figure 11, user interaction modes (previously applied as a model to map research data) were then used to generate user goal and task sets that were anchored in the user journeys. The continued application of the same interaction modes model meant that the journeys could act as a bridge between research, strategy and design.

The user interaction modes, and their associated data, underwent a process of transformation during strategy. For example, the insight that clients desired a broad view of the organization in its totality (across product offerings, business units and jurisdictions) and not just the Banking proposition, was grouped within the user interaction modes of information gathering and product adding however in the user experience strategy framework became drivers for a single-site strategy, personal financial management and the content strategy.

Case study: The design phase

Since the user journeys were based on tactics emerging from the user experience strategy, and not directly from the interaction modes meant that a way of tracing data back to its origins was required to ensure that requirements (data) would not be lost. This was achieved by a further process of mapping scenarios to user interaction modes in the journeys, to goals and tasks that were then organized into site maps and ultimately navigation concepts and lo-fidelity paper prototypes (wireframes).

Although the new user experiences being designed had their origins in research that was heavily human-centered, the immersion in data, its reorganization and transformation meant the design process had become significantly removed from the original understanding of the problem ecology. This suggested that something emergent and original was taking form however it raised the issue of whether the interpretation and transformation of data would produce new experiences and meanings that were not actually desirable to clients: either because multiple solutions stand to exist (where some could be more useful, usable or desirable to users than others) or because of the subjective interpretation of data by the design team.

Figure 12. Wireframe and mid-fidelity (clickable interface) prototypes were generated from user tasks allowing solutions to be tested against users representative of the personae originally derived from research. (Hobbs & Fenn)
Thus users were integrated in the process of designing the end product. In the first round of testing multiple options of screen layout, navigation models, interaction models, section labeling and graphical interfaces were presented and as a result the design was refined. In the second round of testing users were asked to accomplish various tasks by navigating through clickable, mid-fidelity prototypes with associated observations, reactions, and questions posed to users and recorded. Again, the design iterated.

It is worth noting that in both rounds of testing users were selected from the customer base such that they represented a cross-section of the personae the team had derived from the research and used before and after user testing as design concepts were explored.

**Case study: A self-reflective process**

User journeys provide a structured approach to synthesizing large amounts of data in self-reflective, humanistic ways, where the path through complexity can be traced back from artifact to the original problem-formation.

Figure 13 serves to illustrate data flow (as orange lines) flowing back from the final solution to the original research with the addition of the two-way relationship between research and user journeys to demonstrate the traceability of data. Additionally, it demonstrates the bridge provided by user journeys between synthesis, research, and final designed solution artifact: the interfaces for the website and mobile experience.

**Figure 13. Flow of data across the design process (Hobbs & Fenn)**

It is in this respect that user journeys not only provide an approach to solving problems that emerge through complexity, but also narrow the gap between educating, practice, and research.
As an educational tool:
For the purposes of producing documentation that would assist business analysts and developers in building the end online and mobile banking channels, user experience standards and guidelines documentation were created. Key outputs of the design process that required understanding, such that the new systems could be developed correctly, included the user journeys, which presented the over-arching user experience at the appropriate level of detail to provide understanding for the reader of the documents.

At key milestones through the design process (that spanned a year) internal stakeholders required presentation and satisfaction that their needs (both at the project and business levels) were being met. Again, this meant that the story of the design process could be clearly told at both low and high levels of detail, which the user journeys facilitated.
In both examples, the user journeys act as the cognitive bridge to link data, artifacts, process and understanding.

As a research and practice tool:
In 2011 the scope of the project extended to include online and mobile banking for the business and clients in the United Kingdom. The market, business, product offering and clients were at this stage unknown to the project team and although as much inheritance of design as possible was desired (to reduce time to market and provide a global service offering) a process was required to validate this inheritance. The team in the UK required an understanding of the process that had lead to the eventual design of the South African system and it was possible to tell this story using a variety of the artifacts, including the user journeys that had been produced.

The UK team then embarked on a discovery process (including qualitative customer research, internal business requirements gathering and the production of their own data-driven personae) after which their data, insights and requirements were mapped to the user interaction models applied in the South African process. Research data was mapped to themes, user interaction modes, and the user experience strategy as well as user journeys such that a Good, Average, Poor GAP analysis could identify the validity of inheriting the user experience strategy, journeys and related design solution artifacts. To validate further, the solution was then tested with users from the United Kingdom market that aligned to their personas.

These examples serve to demonstrate the way in which the user journeys acted as a key deliverable at the axis of process and design solution and in so doing brought together teaching others about the design, a theoretical foundation for the replication
of the model (and solution) in other contexts and the ongoing use of design artifacts across contexts.

And lastly, not desiring to state the obvious, but this paper presents a case study, as told through the lens of the role of the user journeys applied therein, and thus provides a further bridge (not just internally to the organisation) for the theoretical debate and hopefully use of in teaching students and informing practitioners.

**Conclusion**

Of the defining characteristics of indeterminate problems, the presence of overwhelming amounts of data presents one of the largest challenges to the designer. The complexity presented in understanding, managing and using data as it is discovered, aggregated, mapped, organized, interpreted, synthesized and transformed through human-centered design processes, in the context of the environment of the problem-ecology, requires that the designer has tools that can assist with designing solutions from these large bodies of data.

User journeys provide such a tool. However three important consequences follow:

- Shifts in meaning occur through synthetic construction (Designs Included Middle). These meanings pervade the problem / solution ecology and are likely to impact all stakeholders. It is therefore incumbent on the field to provide ways of making this meaning explicit and thus available to ethical scrutiny.
- Since the transformation of data is visibly recorded in the user journey it becomes both a tool for self-reflection and something that can be shared.
- This provides the opportunity for the designer, the discourse and educators to reflect on design's role in changing meaning (for society at large) and the tools applied for this purpose.
- The output of synthetic construction and the associated shifts in meaning are often hidden in or behind the resultant designed artifact or experience (the chair, the website, the building). It could be argued that the dominant languages of critique available in the field of design exist at this end-product level.
- Tools that offer visibility of and reflection upon the hidden generation of meaning are therefore very important to design and society at large and the current available methods of critique should be expanded to include this dimension of making.
- Clearly there is an emergent and urgent need for design approaches that can both effectively operate in the space of indeterminacy and offer the artifacts of synthetic cognition for reflection. User journeys are just one such tool available from the field of Information Architecture design and further exploration of other approaches and tools from the field of IA warrant inclusion into the broader discourse of the role of design in navigating indeterminacy.
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