AI-Assisted Causal Pathway Diagram for Human-Centered Design

by nasir mohammed 816023707

Background

This paper was written by a team of researchers who have made great contributions to the field of human computer interaction. They are :

Ruican Zhong - University of Washington, Seattle, WA, USA. Ruican Zhong's research focuses on the intersection of HCI and AI, exploring how AI tools can support creative and design processes.

Donghoon Shin - University of Washington, Seattle, WA, USA. Donghoon Shin's work involves developing interactive systems and tools that enhance user experience and support collaborative design.

Rosemary Meza - Kaiser Permanente Washington Health Research Institute, Seattle, WA, USA. Rosemary Meza's research is centered on health informatics and the application of HCI principles to improve healthcare delivery and patient outcomes.

Predrag Klasnja - University of Michigan, Ann Arbor, MI, USA. Predrag Klasnja is known for his work in mobile health (mHealth) and the design of technology interventions to support health behavior change.

Lucas Colusso - Microsoft, Redmond, WA, USA. Lucas Colusso's research at Microsoft focuses on the development of AI-driven tools and systems that enhance productivity and creativity in various domains.

Gary Hsieh - University of Washington, Seattle, WA, USA. Gary Hsieh's research interests include social computing, persuasive technology, and the design of systems that support behavior change and well-being.

Background

The information in this paper is from the CHI conference on human factors in computing systems 2024.

It was published in May 2024.

This paper uses a plugin for Miro that uses GPT4 to investigate the integration of causal pathway diagrams (CPD) into human-centered design (HCD). CPD supports both divergent and convergent design processes, lowers cognitive workload, and boosts creativity, according to a user study.

Abstract

This paper explores the integration of causal pathway diagrams (CPD) into human-centered design (HCD), investigating how these diagrams can enhance the early stages of the design process.

A dedicated CPD plugin for the online collaborative whiteboard platform Miro was developed to streamline diagram creation and offer real-time AI-driven guidance.

A study with 20 designers showed that CPD supports both divergent and convergent processes, reduces cognitive workload, and increases creativity.

The results show how AI-assisted tools can encourage creative work and evidence-based design

CPD provides a clear image, which helps logic tracing and improves communication between designer and product manager.

Methodology

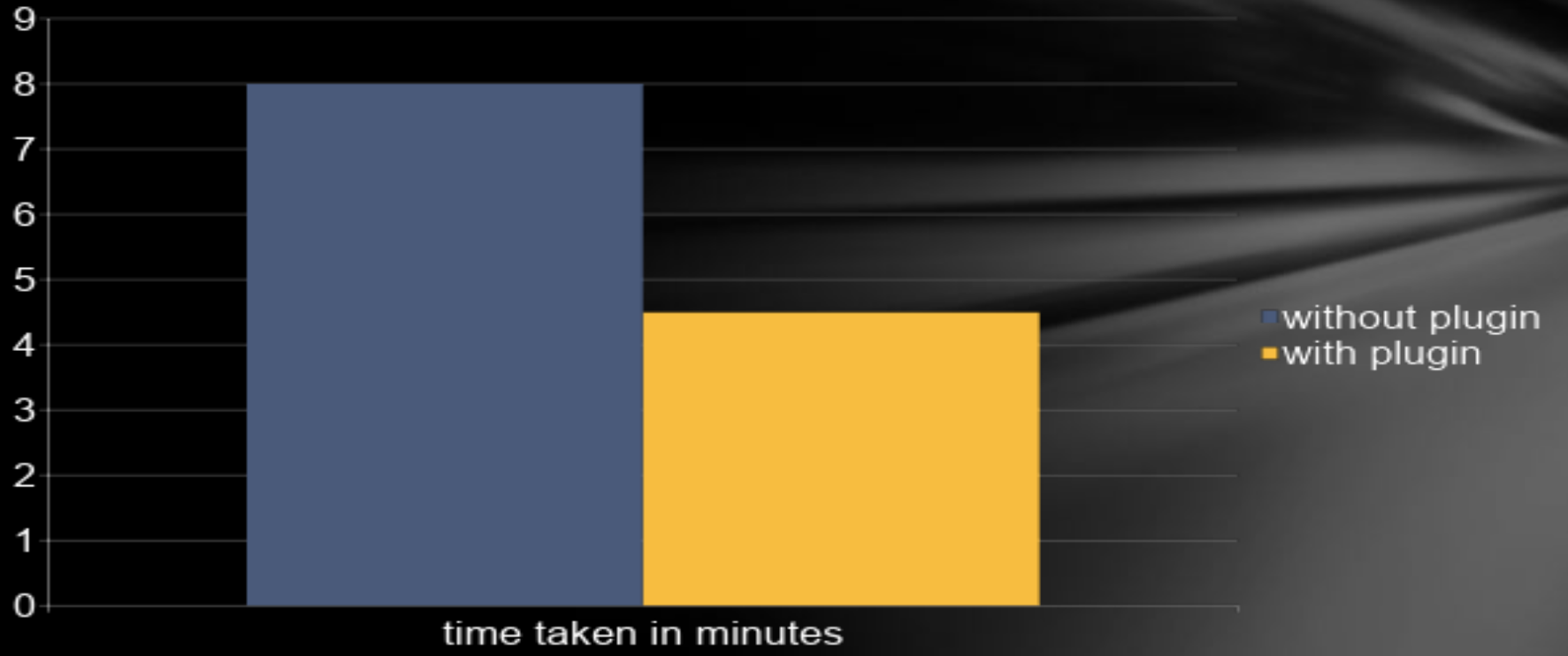
A user study was done with 20 people to test the implementation of CPD into HCD using a plugin developed in Miro. It lets users create diverse visual elements, such as text boxes, circles, and rectangles on a collaborative board. The users had to brainstorm solutions for problems given to them using CPD and the plugin. They were given an introduction to CPD and a tutorial on how to generate a CPD using an example. Then the users were given a design prompt, a user persona, and a scenario explaining the issues the persona was encountering in that context. Participants were asked to generate CPDs to create possible solutions. For one of the design sprints, participants were given the plugin to help generate CPDs. In the other design sprint, they were not given the plugin. After each design sprint, we asked participants questions about their experiences with using CPD (and the plugin when in the plugin condition).

The point of the study was to answer the questions "How do designers use CPD in human-centered design?" and "How does the plug-in support practitioners in designing with CPD?"

Results

It was found that designers are positive about integrating CPD in the early stages of human-centered design, especially for brainstorming and strategic prioritization. It was also found that the plugin was able to reduce the cognitive workload involved in memorizing the CPD framework, allowing users to focus their energy on the design task and the plugin was able to enhance designers' creativity in the brainstorming session.

Results


9
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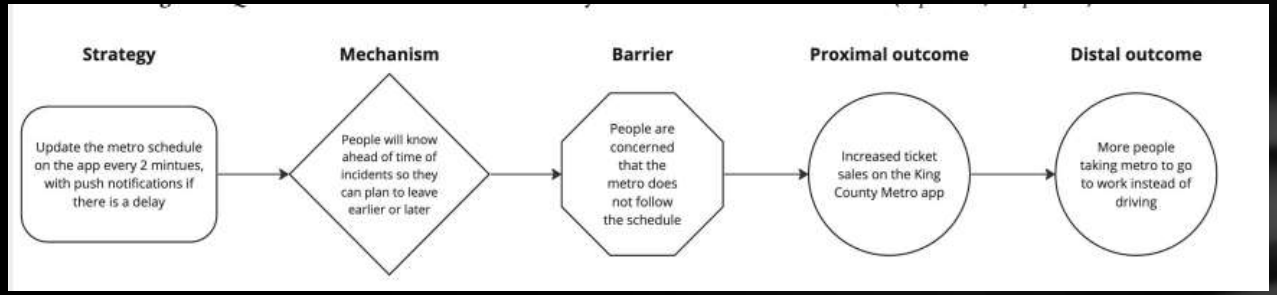
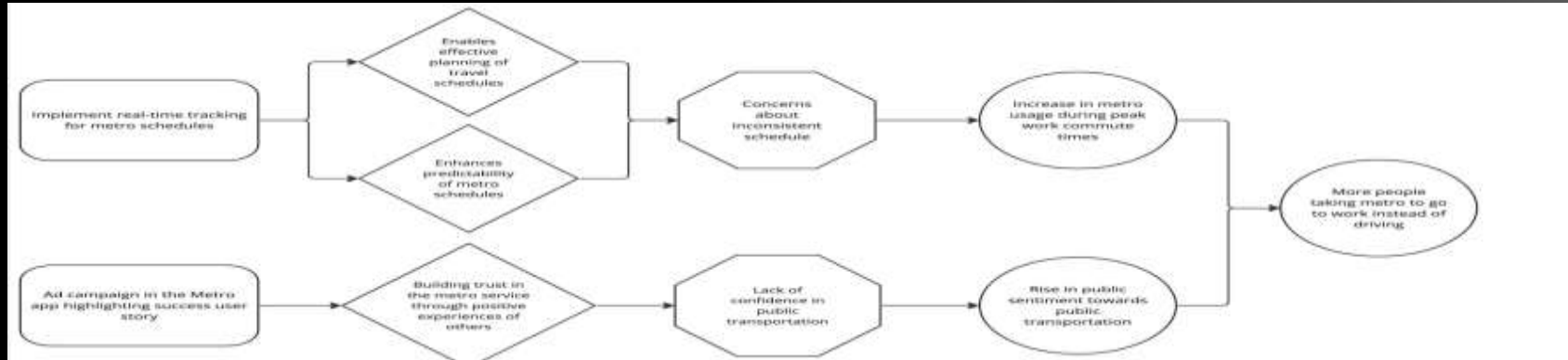
time taken in minutes
without plugin
with plugin

Results

Example of CPD without using the plugin





Discussion

The plugin's real-time AI-driven guidance helps designers focus on conceptual work rather than the mechanics of diagram creation, making the design process more efficient and effective. This is consistent with basic concepts in design thinking and HCI, which call for designers to strike a balance between creativity and well-organized decision-making.

It would help with communication among stakeholders, helping them express ideas clearly and structure conversations effectively because of its visual and structured design. It was also found to be helpful for presenting design ideas to non-design stakeholders, like product managers and end users.

The AI-powered plugin helped reduce cognitive workload, allowing designers to focus more on creativity rather than technical details. However, users expressed concerns about multitasking and the potential oversimplification of design tasks by the AI.

The rise of AI-assisted design tools in HCI is both promising and controversial. AI can imitate human capabilities by automating tasks, freeing designers to focus on creative thinking. But the reliance on AI-driven guidance might lead to over-dependence on AI suggestions, potentially stifling designers' creativity and critical thinking.

Discussion

Users also raised concerns that CPD could be misused, like when used without proper user research or in context that rely on AI recommendations. The use of AI in design raises ethical concerns, such as ensuring the responsible use of AI suggestions and maintaining transparency with stakeholders about AI's role in the design process.

Conclusion

This paper explores how Causal Pathway Diagrams can enhance Human-Centered Design mainly in the early stages of the design process. A CPD plugin was developed for the Miro platform to streamline diagram creation and offer real-time AI-driven guidance.

By integrating CPD into HCD, the paper describes a method that can improve the design process, making it more structured and evidence-based. This can lead to more effective and user-friendly designs.

A study with 20 designers found that CPD supports both divergent and convergent processes, reduces cognitive workload, and increases creativity. The findings highlight the potential of AI-assisted tools in supporting creative work and evidence-based designs. The emphasis on evidence-based design ensures that designs are accurate in research and theory, which can lead to more reliable and effective outcomes. This approach is important in HCI as the field continues to address complex, real-world problems.

This paper expands HCI by offering fresh tools and resources that improve the design process, create innovation, and encourage ethical concerns when using AI.

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Websites Need Your Permission Too – User Sentiment and Decision-Making on Web Permission Prompts in Desktop Chrome

Rajiv Ramcharan - 816034922

Background

Author

Marian Harbach

- Affiliated with Google

Significance in HCI field:

- Focus on user behaviour and sentiment towards technology
- Research related to security and privacy through interactions on the internet

Abstract

Main Objectives

- To analyze how users interact and respond to permission prompts in the web particularly on desktop Google Chrome.
- To identify what influences and which factors affect users in accepting, denying, dismissing or ignoring permission prompts.
- To examine the importance of contextual information in users' decision making towards granting permissions.

Abstract

Contributions

- Overview of users' sentiment towards four permission types and their decision between four actions to the permission prompt.
- To see to what extent a prior user interaction on a given website improves the sentiment and decision making towards the prompt.

Abstract

Findings

- The most common actions chosen by users are dismissing or ignoring the permission prompt
- Many users have a reasoning behind their action toward the permission prompt.
- Contextual information positively impacts the likelihood a user grants permission.

Methodology

1. Telemetry Data Analysis

Telemetry data from more than 100 million Chrome installations is analyzed.

“Help improve Chrome’s features and performance” toggle in Chrome settings.

2. Experience Sampling Approach

Responses collected from 25,706 Chrome users

Users are invited to answer a questionnaire that showed approximately five seconds after a user made a choice on a permission prompt.

3. Statistical Testing

Omnibus tests

Logistic regression

Results

Key Findings

Overall, 63.9% did not find permission prompts annoying.

The most ignored or dismissed prompts were for geolocation and notifications.

- Users felt that these were annoying and disruptive.

Prior user interaction with a website heavily influences their decision making for permission prompts.

- Ignore rates decreased by 21% and allow rates increased by 18% overall.
- Geolocation is the most influenced with allow rates increasing from 9% to 27.4%.

Results

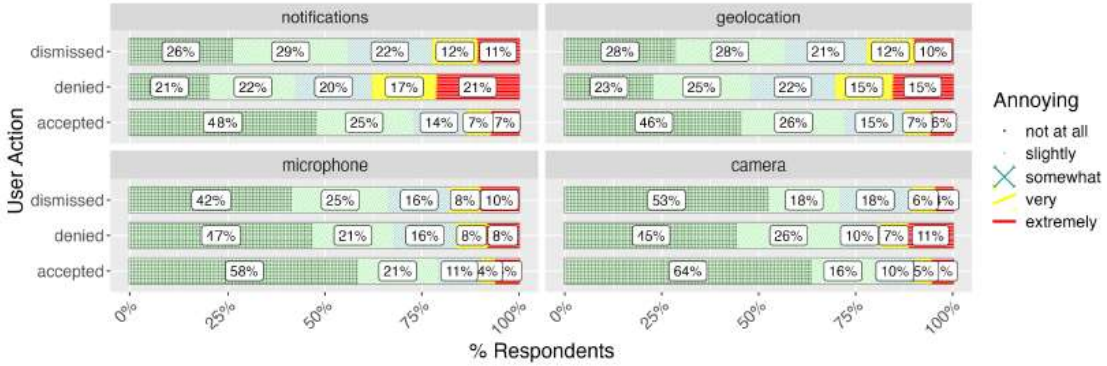

Figure 6: Respondents' answers to the question how annoying they found the permission prompt (Q1 in questionnaire 1) across the requested capabilities and action they took on the permission prompt.

Results

Table 5: Responses to the questions on annoyance and ease of decision making as top-2-box scores ("not at all" or "slightly annoying"; "somewhat" or "very easy"). Two separate omnibus χ^2 tests were applied to each dependent variable. Blue and green cell background and * or ** indicate standardized residuals (sresid) > 2 and > 5 respectively. Yellow and orange cell background and § and §§ indicate sresid < −2 and < −5 respectively.

User Action	Capability	# not annoying	% not annoying	# easy	% easy
accepted	notifications	722	72.6%*	505	50.8%§
	geolocation	739	72.1%*	593	57.9%
	microphone	826	79.1%**	676	64.8%*
	camera	835	80.0%**	643	61.6%
denied	notifications	439	42.3%§§	651	62.7%
	geolocation	499	47.8%§§	699	67.0%*
	microphone	230	67.6%	196	57.6%
	camera	124	70.9%	102	58.3%
dismissed	notifications	578	55.7%§	486	46.9%§
	geolocation	522	56.7%§	506	54.9%
	microphone	251	66.2%	200	52.8%
	camera	112	70.9%	78	49.4%
Total		5,877	63.9%	5,335	58.0%
Omnibus χ^2			$\chi^2(11) = 671$, $p < .0001$		$\chi^2(11) = 156$, $p < .0001$

Results

Table 6: Results of a logistic regression using feeling "not at all" or "slightly" annoyed as the dependent variable.

	Not annoying			
	Log odds	Std. Error	Odds	sig.
(Intercept)	0.78	0.054	2.19	***
Capability				
geolocation	0.10	0.053	1.10	.
microphone	0.55	0.069	1.73	***
camera	0.62	0.079	1.85	***
User Action				
denied	-0.99	0.056	0.37	***
dismissed	-0.63	0.057	0.53	***
Had prior user interaction	0.14	0.050	1.15	**

Discussion

- Permission prompts are more annoying when users do not allow.
- Availability of contextual information for a given benefit is associated with allowing.
- Being able to ignore or dismiss permission prompts is useful.
- Prior user interaction is associated with the prompts being allowed and less annoying.

Limitations

- Research was only limited to Chrome desktop users.
- Users who disabled the “Help improve Chrome’s features and performance” setting would have reacted differently.
- Only limited to four permission types

Conclusion

We notice key differences in user behaviour towards permission prompts when looking at desktop Chrome

- Less annoying when prompts are allowed
- The ability to ignore and dismiss is important to users

To address these two key issues, the Chrome team is currently exploring an alternate approach to permission prompts that may help nudge developers towards asking a more opportune times with more contextual information and alleviate the problem of users not noticing prompts.

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And more…

(Un)making of AI magic: A presentation

By Brandon Chandoo, 816034693

Background of the Authors

Maria Luce Lupetti

From the TU Delft, concerned with human entanglement with the Artificial World,focusing on using design to promote responsible development of AI.

Dave Murray-Rust

Associate Professor from the TU Delft. Studies focus on how people interact with algorithms and technology. Trying to balance privacy,choice and identity.

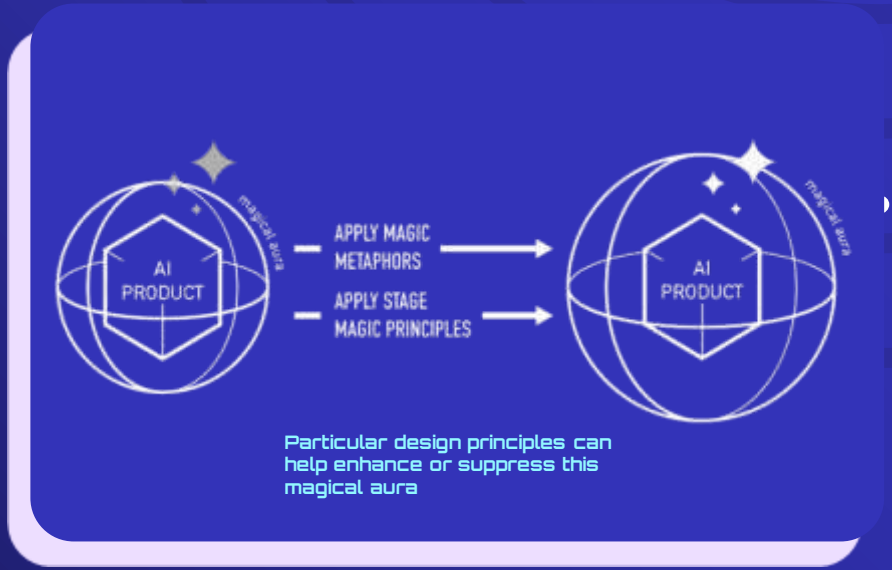
The Paper for discussion

(Un)making of AI: a Design Taxonomy is a research paper that goes into detail about how design choices made in regards to AI product help to enchant (or disenchant) the users of the product and explores the roles that designers play in the enchantment

Visualization of the magical aura that AI products possess

Enchantment in AI

Enchantment in the context of the paper refers to how we get captivated and carried away when imagining the capabilities and features of AI due to our lack of fundamental comprehension on the workings of the technologies particularly since the technology is new.



Abstract

- **Focus of the paper**
  - Explores the role of *enchantment* in AI-product design
- **Use of a taxonomy**
  - A taxonomy was used to explain methods of *enchantment* and *disenchantment*
- **Findings**
  - 7 different principles were identified in AI-products which work cohesively to *enchant* or *disenchant* users
- **Discussion of Design Principles**
  - Interactions between specific design principles were highlighted
  - Strategies for using these principles in future products were provided
- **Future considerations**
  - How to apply these considerations for enchantment and disenchantment in future AI products was discussed.

Methodology

Discussion of AI developments

- Authors discuss the discourse around new developments in ai
- AI is compared to magic due to the ambiguity of its operation
- Analysis of 52 student-designed projects from a masters in AI-Design course was performed
- From the analysis, 7 design principles were proposed that helped *enchant* or *disenchant* users of the product
- The effects of these principles were explored
- Interactions of these design principles were also explored

The design principles identified

Apply Stage Magic Principles

The use of “smoking mirrors”to enhance engagement

Applying Magic Metaphors

Playing on magical concepts in the design of the product

Summoning AI as a supernatural entity

Presenting the AI as a powerful being further mystifying it

Materialize Beliefs

Playing on the beliefs people already hold about AI

Manifest Mechanisms

Making the methodology of the product more Apparent

Play with AI

Letting users engage in a cycle of curiosity and understanding

Presume AI

Product is Designed to be enhanced by AI

Results

- **A revised taxonomy**
  - The design principles theorized were present in the AI products
  - The initial taxonomy proposed 4 design principles which work in pairs to either enchant or disenchant
  - From the analysis a further 3 were found and further interactions between the principles was documented
  - Play with AI and presume with AI are unique

The design principles quantified

18 Projects

Used Stage Magic Principles

4 Projects

Applied Magic Metaphors

15 Projects

Summoned AI as a Supernatural Entity

1 Project

Materialized Beliefs

3 Projects

Manifested Mechanisms

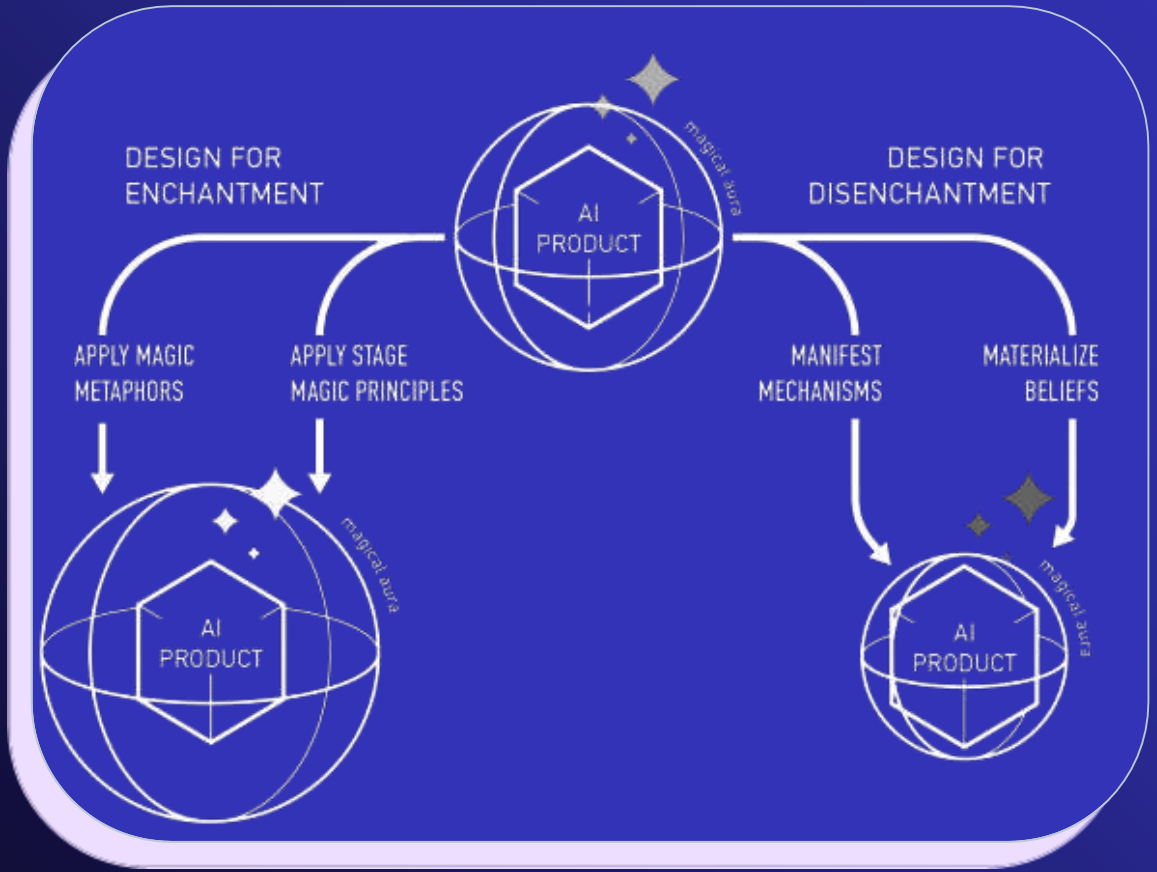
1 Project

Encourage AI-Play

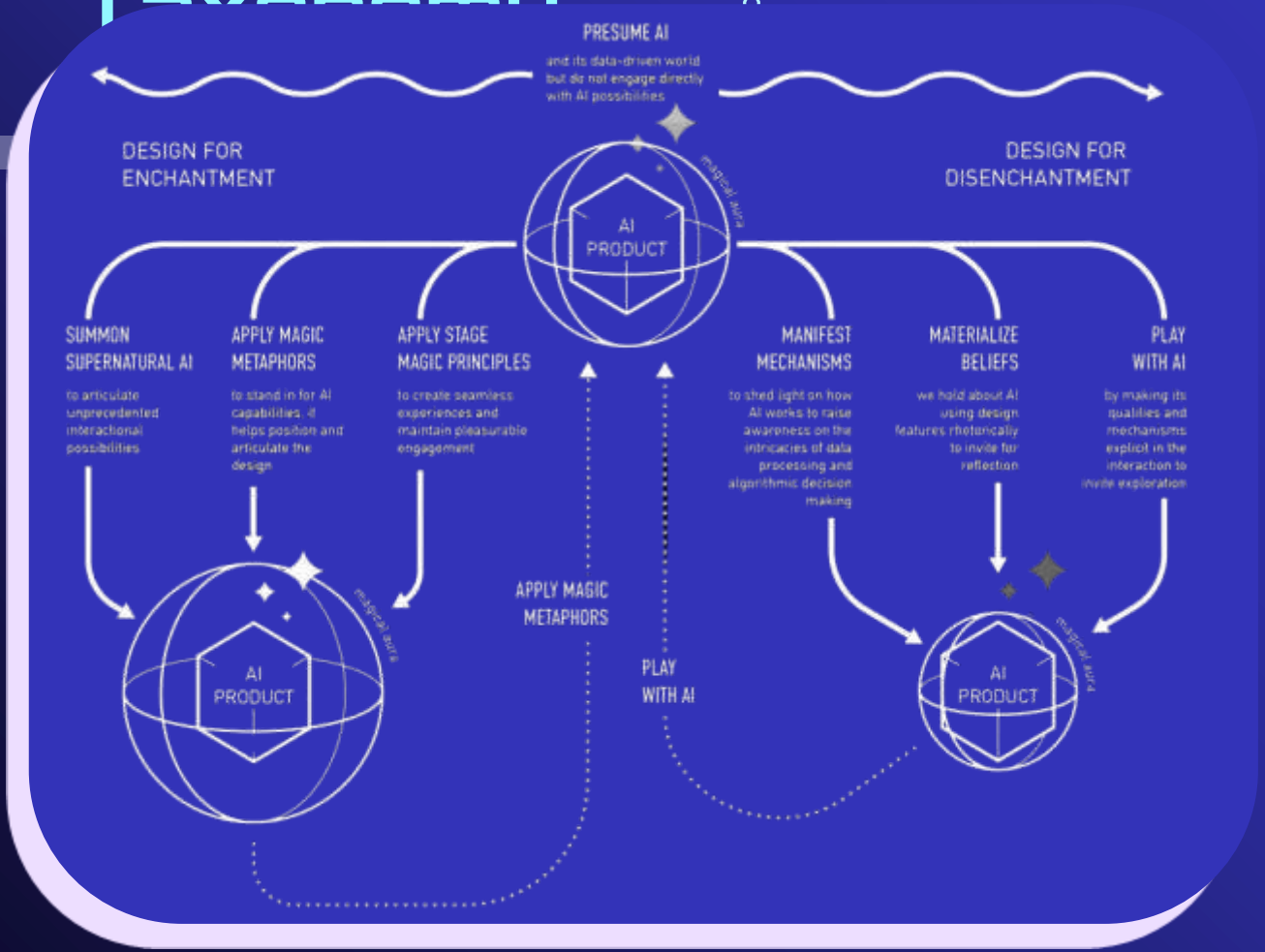
4 Projects

Presumed AI

The Initial Taxonomy



The Revised Taxonomy



Discussion

- Taxonomy Purpose
  - Acts as an early attempt to understand and classify design principles in AI products (acts as a Nascent Design Theory)
  - To help designers navigate the space of AI and AI product design as designers are also influenced by these principles.
  - To allow designers to understand the impact these design choices have on AI and take responsibility for their impact on the culture around AI
- Project Behavior under these design principles
  - Often in these products, multiple design principles are present
  - One thing to note is that in most cases, one design principle dominated the others implemented.
  - The combination of multiple design principles altered the overall effect had on the AI product’s enchanting aura.
- Enchanting and Disenchanting Interactions
  - When an enchanting principle is combined with a disenchanting principle, the enchanting principle is overridden.
  - ‘Materialize Beliefs’ and ‘Manifest Mechanisms’ when combined usually override enchanting principles.

Conclusion

- AI product designers need to be aware of their chosen design principles’ effects on their products as they shape cultural perceptions of AI
- Enchantment exists inherently in newer technologies. AI enchants with the promise of being an omnipotent and infallible resource that is capable of thought and other complex human emotions
- This taxonomy is primitive and should not be strictly adhered to, rather it should act as a tool moving forward to reflect on the consequences of particular design principles.
- An enchanting aura around an AI product is not a bad thing, however, Maintaining a balance between enchantment and transparency of operation is an ethical concern for AI products.

The end

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Among others....