

An exploratory study of co-design skills in the U.S. job postings

Xie, Yumeng^{*a}; Mejía, G. Mauricio ^a; Zheng, Wenqi ^a

^a Arizona State University, Tempe, AZ, USA

* yumeng.xie@asu.edu

With the increasingly complex challenges and issues in the real-world, designers are changing their roles in design practices and influencing organization hierarchy. Co-design becomes crucial to implement more successful design practices and has caught attention in academia. However, there are few studies about the demands or application of co-design in the real-world job market. This exploratory study analyzes 638 job postings across design practices (graphic/product /experience/service design, design research, design management) in the U.S. job market, and identifies five relevant and important co-design skill categories including research, knowledge transformation, collaboration, synthesis, visualization that employers expect from designers. Furthermore, this study presents and elaborates significant different frequencies and requirements of specific co-design skills across design practices, and also suggests that design employers are requiring more skills related to co-design. This paper can provide insights and recommendations of co-design skills to researchers and designers in this field.

Keywords: co-design skills; design practices; design industry; job postings; the U.S.

1 Introduction

Nowadays, design practices have become increasingly complex and interconnected and faces issues that cannot be solved by any individual discipline or expert alone. For example, knowledge and expertise from engineering, marketing, suppliers, management, and production are integrated into product design (Lang, Dickinson and Buchal, 2002). Working and collaborating with different stakeholders in the design process has the potential to support the complex challenges that designers face when dealing with emergent technologies, working to provide business value, and making sure that solutions are sustainable and just. Design professionals need to understand and solve complex problems co-designing with other professionals and stakeholders (Moreno and Villalba, 2018; Rodgers, Mazzarella and Conerney, 2019). Designers' roles nowadays are increasingly important in problem-solving and decision-making processes in organizations, at the same time, making social impacts (Feast, 2012). Co-design skills become essential competitiveness for designers when facing complex issues in society and the job market. While co-design and participatory design have become increasingly relevant in academia (e.g. Luck, 2018), little is known about their demand or adoption in the design industry. This study is an exploratory analysis of co-design skills in the U.S. job market. We identified co-design skills in literature and conducted a quantitative content analysis in the current job postings for several design practices.

2 Co-design

Co-design is the activity that stems from participatory design in which designers collaborate with other professionals, non-designers, and stakeholders who are the 'experts of their experiences' in the whole design development process (Visser *et al.*, 2005; Sanders and Stappers, 2008). Co-design is popular in business and marketing and it can be implemented by co-creation to bridge the gap between companies and customers (Piller and Tseng, 2003); for example, managers increase value by gathering insights and ideas from consumers in developing products (Prahalad and Ramaswamy, 2004). Co-design practices challenge the conventional hierarchy of organizational power structures; instead, it empowers, and values collective creativity generated by a whole team including designers, researchers, customers, and other stakeholders. Co-design also benefits the industry by providing positive influence and enhancing the business competencies in many perspectives. For instance, it enables companies to be more flexible and responsive to users/clients' real needs about the product (Wu *et al.*, 2015). Participatory design is a specific co-design approach that places more emphasis on collaboration with community members. It is based on the democratic involvement of end-users via

diverse engagement approaches (Simonsen and Robertson, 2012). In conventional design practice, professional designers work for clients rather than working with stakeholders, which may neglect long term-impacts. Participatory design can navigate democratic design processes through meaningful engagement with communities, clients, and other stakeholders (Xie *et al.*, 2020).

2.1 Co-design skills

Co-design skills are emergent design skills that are becoming popular in academia. Researchers and the business community are increasingly realizing that users/customers are the real experts of their experience, which encourages them to motivate collective creativity through utilizing codesign skills and techniques (Sanders and Stappers, 2008). They stated that different from the user-centered design and traditional design, co-design asks designers also to play ‘hybrid’ roles as researchers in most situations. This means designers not only passively receive knowledge from users to create ideas and concepts, but also have to serve and support the creativity of those users who are actually ‘experts of his/her experience’ (Visser *et al.*, 2005). Research abilities are significant for designers throughout the co-design process. Furthermore, designers/researchers have transferred their roles from translators to facilitators (Siu, 2003) to motivate users/clients’ expression, creativity and even be the co-designers in the codesign process (Sanders and Stappers, 2008). Burkett stated co-design skills equipped designers with mindset and tools, which enable them to ‘collaborate, include and design WITH people that will use, deliver or engage with a service or product’ (Burkett, 2012, p. 4, uppercase in reference). Co-design skills required may vary in different design disciplines. For instance, previous cases have shown that graphic designers lacked understanding or engaging with end-users or clients, however, more researches suggest graphic designers need to apply user-centered, co-design, and participatory methods to share knowledge/skills continuously for achieving meaningful design (Frascara, 2004; Taffe, 2015). In user experience design, simplicity, playful engagement, sharing language are becoming important usability goals beyond traditional goals such as effectiveness, efficiency, and satisfaction to help designers co-design and communicate more effectively with customers and stakeholders (Dodero *et al.*, 2014).

In general, co-design requires designers to develop several skills beyond classic skills in aesthetics, abduction, and creativity. We reviewed relevant literature and organized the skills into five categories, which are presented below:

- *Research skills*. This includes insights gathering to understand the context and collect valuable insights from users/customers (Visser *et al.*, 2005; Sanders and Stappers, 2008; Cabrero *et al.*, 2016; Mazzurco, Leydens and Jesiek, 2018; Ambole, 2020); and empathy to make

emotional responses to construct, define and develop undefined ideas or concepts with stakeholders (Druin, 2002; Sanders and Stappers, 2008; Vaajakallio, Lee and Kronqvist, 2013; Mazzurco, Leydens and Jesiek, 2018; Van Mechelen *et al.*, 2019; Ambole, 2020).

- *Knowledge transformation skills*. This includes insight analysis to make sense of the interactions among people, knowledge, artifacts, systems (Sanders and Stappers, 2008; Feast, 2012; Vaajakallio, Lee and Kronqvist, 2013; Cabrero *et al.*, Xie *et al.*, 2020) ; knowledge integration to bring outside knowledge to guide and inspire design (Postma and Stappers, 2006; Cabrero *et al.*, 2016; Pirinen, 2016; Mejía *et al.*, 2020; Xie *et al.*, 2020) ; and flexible knowledge to understand and transfer different discipline knowledge between experts and novices (Feast, 2012; Ambole, 2020; Xie *et al.*, 2020).
- *Collaboration skills*. This includes general collaboration to identify, collaborate, and co-create with the public (Vaajakallio, Lee and Kronqvist, 2013; Sangiorgi, 2015; Van Mechelen *et al.*, 2019); and communication to understand collaborators not only between design teams but also cross-cultural/disciplinary communication (Sanders and Stappers, 2008; Vaajakallio, Lee and Kronqvist, 2013; Wu *et al.*, 2015; Pirinen, 2016; Xie *et al.*, 2020) ; and facilitation to a) stimulate conversations with the public, and help participants express ideas in diverse ways (Siu, 2003; Sanders and Stappers, 2008), b) motivate individuals and teams to identify their roles (Sanders and Stappers, 2008; Sangiorgi, 2015; Pirinen, 2016), c) lead and moderate to stimulate conversations with the public (Sanders and Stappers, 2008), and d) engage with communities, citizens, stakeholders, target audiences, participants and users through diverse events such as pop-up meetings, workshops (Sanders and Stappers, 2008; Sangiorgi, 2015; Ambole, 2020).
- *Synthesis skills*. This includes creativity to think beyond the immediate design task and look forward to generating innovative ideas (Sanders and Stappers, 2008; Van Mechelen *et al.*, 2019); and decision-making to make decisions especially when lacking complete information/data (Sanders and Stappers, 2008).
- *Visualization skills*. This includes representation to provide users a better understanding of design, and also get insights from them creatively. For example, utilizing personas, sketching, or storyboarding to better

address design concepts with non-designers (Sanders, 2000; Sanders and Stappers, 2008); prototyping techniques to help participants express ideas with enjoyable participation (Sanders, 2000; Postma and Stappers, 2006; Sanders and Stappers, 2008; Sangiorgi, 2015; Ambole, 2020); and supporting stakeholders to be creative and participate in the design process (Sanders and Stappers, 2008; Cabrero *et al.*, 2016).

3 Methods

In order to understand what the most recent U.S. employers' expectations for co-design skills are, we conducted a quantitative content analysis study. We collected job postings in the US on March 28th, 2021. We conducted the research study based on the major job search engine Indeed (indeed.com) and scraped data from seven general design disciplines (see table 1 for search terms used), selected up to 200 posts per discipline for a total of 804 job postings. The search criteria were limited to full-time positions and posts published in the last 14 days excluded part-time positions, internships, and other unrelated posts. We also manually removed duplicate job position posts and finally had a sample of 638 job posts.

Table 1. Search terms for collected and analyzed posts

General discipline	Included search terms	# of search results	# of scraped posts	# of deleted posts	Total posts analyzed
Graphic design	graphic design, graphic designer, communication design, communication designer, visual design, visual designer	964	200	52	148
Industrial design	industrial design, industrial designer	34	34	4	30
Product design	product design, product designer	351	200	47	153
Experience design	experience design, experience designer, UX design, UX designer, interaction design, interaction designer	524	200	34	166
Service design	service design, service designer, strategic design, strategic designer, design strategy, design strategist	49	49	14	35
Design research	design research, design researcher	15	15	0	15
Design management	design lead, design leader, design manager	149	149	58	91

We extracted essential information from 638 job postings, which includes company names, position titles, and position descriptions. The latter include job responsibilities, qualifications, technology skills required and preferred, education level, experience level, etc). Then we conducted a quantitative analysis of the position descriptions to identify and synthesize co-design skills expected by employers in the job market. Before running the frequency tests, in order to identify the common themes, patterns used in both academia and design industry, we developed a co-design skill thesaurus of terms based on scholarly literature references (in the previous section) and qualitative analysis of a subsample of 16 job posts (see table 2).

Table 2. Co-design skill thesaurus

Co-design skill categories to test	Thesaurus from scholarly literature references	Complementary thesaurus from qualitative analysis of 16 job postings
Research skills	research, observation, interview, empathy, gather insight	test, usability, contextual inquiries, mixed-method approach, quantitative, qualitative
Knowledge transformation	Knowledge transformation, translation, transfer, insight analysis, knowledge integration, flexible knowledge	persona
Collaboration	Collaborat*, facilitat*, lead*, community engagement	listen, coach, network
Synthesis	Speculation, imagination, creativity	Problem-solving, innovat*, wireframe, user flow, customer journey
Visualization	Visualization, Storyboard, Storytelling, prototype	sketch*, draw*, mockups, illustrations, models

We then analyzed the data after scraping the job posting data from Indeed. We computed the frequency of each skill category and term in the thesaurus and compared it across disciplines to determine those that demand more co-design skills. Then, we used Pearson's chi-squared test to examine if there were statistical differences in co-design skills among design disciplines. The null hypothesis we

made was: different design disciplines' practices require the same proportion of co-design skills, if $p < 0.05$, then the statistical results are significant to reject the null hypothesis, which means employers in different practices have different requirements of the co-design skills. We also conducted a qualitative content analysis of the 13 job posts that used the terms co-design or participatory design. Our aim with this last activity was to make sense of how the industry uses explicit terms.

4 Findings

Surprisingly the term co-design only appeared in three job postings (experience design [1] and service design [2]) and the term participatory design in nine (product design [1], experience design [4], service design [2], design research [1] and design management [1]) and there were no significant differences. Experience design and service design were the main disciplines that require co-design and participatory design skills. It shows customers, users, and stakeholders play important roles in co-design, and participatory design enables designers to execute and embody their co-design ideas and activities through facilitating participatory sessions such as user testing or workshops.

We also identified the frequency of terms from the co-design skills thesaurus in the job descriptions (see table 3, total 42 skills but only showing the 26 terms that had at least 20% frequency in one discipline or had significant differences). There were several skill terms with significant differences in the categories of research (research, test, usability, quantitative, and qualitative), collaboration (facilitat*), synthesis (wireframe, user flow, customer journey), visualization (prototype, sketch*, draw*, illustration, models). Some terms had high frequencies but there were no significant differences in the categories of research (interview), knowledge transformation (persona), collaboration (collaborat*, lead*), and synthesis (innovat*).

Table 3. Co-design skill terms frequencies in the U.S. job postings descriptions

Skill term	P-value (*significant)	Graphic design	Industrial design	Product design	Experience design	Service design	Design research	Design Management
Research skills								
Research	0.0000*	25%	43%	72%	69%	77%	100%	33%
Interview	0.4109	22%	17%	35%	33%	26%	53%	21%
Empathy	0.2614	2%	3%	9%	9%	11%	20%	3%
Test	0.0009*	24%	37%	67%	65%	46%	53%	39%
Usability	0.0000*	5%	10%	25%	46%	20%	40%	13%

Quantitative	0.0082*	0	0	10%	8%	11%	40%	4%
Qualitative	0.0003*	0	0	13%	12%	20%	53%	4%
Knowledge transformation skills								
Persona	0.4641	30%	47%	41%	49%	46%	53%	30%
Collaboration skills								
Collaborat*	0.8581	64%	67%	71%	81%	80%	87%	64%
Facilitat*	0.0001*	2%	0	22%	22%	40%	27%	17%
Lead*	0.0921	41%	60%	71%	64%	77%	53%	83%
Listen	0.4903	5%	3%	6%	8%	20%	20%	3%
Synthesis skills								
Creativity	0.5574	16%	30%	12%	11%	9%	13%	7%
Problem-solving	0.6734	14%	17%	20%	20%	20%	0	15%
Innovat*	0.6734	36%	53%	51%	44%	66%	60%	47%
Wireframe	0.0000*	5%	0	38%	51%	23%	0	18%
User flow	0.0000*	2%	0%	29%	39%	20%	7%	13%
Customer journey	0.0294*	1%	3%	9%	10%	26%	7%	4%
Visualization skills								
Visualization	0.4826	6%	20%	10%	10%	9%	0	16%
Storyboard	0.1396	7%	13%	5%	20%	9%	13%	7%
Storytelling	0.4282	5%	3%	7%	5%	23%	20%	3%
Prototype	0.0000*	5%	43%	51%	61%	49%	13%	19%
Sketch*	0.0007*	17%	70%	48%	50%	34%	7%	33%
Draw*	0.0021*	1%	37%	10%	4%	9%	0	18%
Illustration	0.0026*	20%	3%	2%	2%	3%	0	3%
Models	0.0172*	1%	37%	14%	8%	11%	7%	8%

5 Discussion and Conclusion

The lack of use of the terms of co-design/codesign and participatory design in U.S. job posting suggests that there is little incorporation of these academic terms in the industry. However, co-design skills are increasingly required. In the research category, it was obviously expected that design research jobs require more research skills. Notably, newer design disciplines (product design, experience design, design research) require more research skills than traditional design disciplines (graphic

design, industrial design). Design management jobs tend to be located in the middle, likely because of the focus on leadership.

Surprisingly the terms in the knowledge transformation skills category had very low frequencies. These terms are more academic and are not typically used in the industry. It is also likely that these skills are included within research skills. In the collaboration category, frequencies show that there is a high demand for these skills. However, it seems that collaboration is framed in an expert view rather than participatory because the terms community engagement had low frequencies and the term lead had more frequencies than the term facilitat*. Additionally, newer design disciplines (product design, experience design, service design, design research, design management) also require more collaboration skills than traditional design disciplines (graphic design and industrial design), but only the term facilitat* had significant differences. The situation with graphic design may be explained that graphic designers who worked as external roles for organizations might require fewer teamwork skills compared with those who worked within organizations, and external designers were considered to contribute with more creativities (Dziobczenski and Person, 2017).

In the synthesis and visualization skill categories, there were relatively lower frequencies. Terms that had high frequencies seem to be more discipline-specific. For example, the term wireframe appears in 51% of experience design posts and the term sketch appears in 70% of industrial design posts. Employers in all design disciplines demand synthesis and visualization skills, but they use different terms for them. Further, it is unclear how these skills are connected to activities of co-design. Sketch skills can be used to visualize either expert-driven designs or participatory-driven co-designs.

While these findings render relevant insights, certainly other non-co-design approaches also use the terms we identified in the literature as co-design skills. For example, research is a popular term in human-centered design even practiced in an expert view. Also, design employers require many skills related to co-design, it is unclear to what extent collaborative work is a priority in the design industry. Nonetheless, the design industry is requiring skills that increase teams' capacity to implement co-design activities, even if they are not currently applying it for that aim. Further research using qualitative content analysis would explain better the demand and application of co-design skills in the U.S. job market.

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