

The background of the entire page is a monochromatic, textured image. It features a series of concentric, overlapping circles and ripples, similar to the pattern created by a stone dropped into water. The lines are more pronounced in some areas, creating a sense of depth and movement. The overall color palette is a range of greys, from light to dark, giving it a subtle, organic feel.

# Designing Service Entanglements

– Towards Stakeholders Centered Perspective in Design

Eunki Chung

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Submitted to the School of Design,  
Carnegie Mellon University,  
in partial fulfillment of the requirements for the degree of  
Master of Design in Interaction Design  
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## ABSTRACT

Everyday, people chain interactions across multiple mobile services into single service experience. For example, when taking a trip, people switch between a number of mobile and online services as they move between here and there. Interestingly, current User Centered Design and Service Design methods generally ignore the use of other services outside of the single service being designed. Designers rarely consider entangling the service they are creating with the many other services users may wish to use. This thesis provides the current states and challenges of designing for entangled services. My investigation suggests an alternative approach; taking a stakeholder-centered perspective to capture values co-produced by services in designing entanglements.

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My parents

**thank you.**



# Designing Service Entanglements

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# Designing Service Entanglements

– Towards Stakeholders Centered Perspective in Design

## INTRODUCTION

The rise of mobile and social computing technology has changed how services are offered and experienced. Many services have become interconnected with each other. For example, it is common to notice a “Sign up with Facebook” [1] button when people start using an application or a service.

In this thesis, I define entangled services to capture the interrelationship among technology-based services. Entangled services include both online - offline services and virtual - physical touchpoints. Entangled services co-produce a value flow and an experience. From a user’s perspective, entangled services take the form of a UI intersecting two different services or more. Services become entangled through un-bundling and re-bundling [2] activities. In reviewing the different forms entangled services take, I came up with the following three categories.

The first kind of entangled services are *dependent services*. From the perspective of a service, interrelationship of dependent services is so crucial in the value creation that one service cannot function without functions from another. From a user’s perspective, entangled services could seem to a single service because of tight integration. Data aggregation technology services like Flipboard [3] or Kayak [4] are examples of this first kind of entangled services. They cannot produce a value or an experience without other services (contents and information providers).

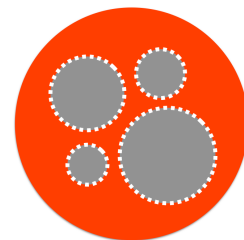
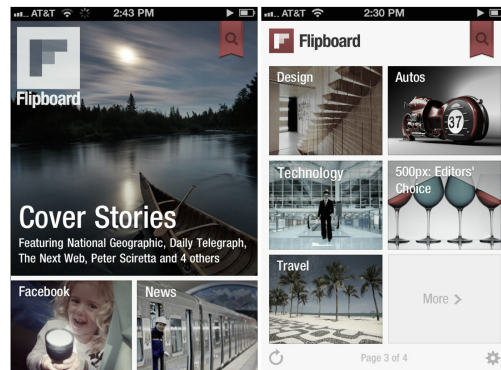


Figure 1. Flipboard - model of dependent services

The second kind of entangled services are *featuring services*. In this case, services co-produce an experience by featuring a third party service within a touchpoint on a service journey. Users can see the value of entangled service feature, but they might not choose to use the feature. For example, Uber, a ride sharing service, offers Spotify music. Drivers can play from the

1. Facebook. 2008. Facebook Across the Web. <http://www.facebook.com/notes/facebook/facebook-across-the-web/41735647130>. Accessed Aug, 2015.

2. Richard Normann. 2001. Reframing Business: When the Map Changes the Landscape. West Sussex, England: John Wiley, 26-36.

3. Flipboard: <http://flipboard.com>

4. Kayak: <http://kayak.com>

passenger's Spotify playlist during a trip [5]. Featuring services are entangled only in a part of user's experience of a service and not perceived as an integrated service.

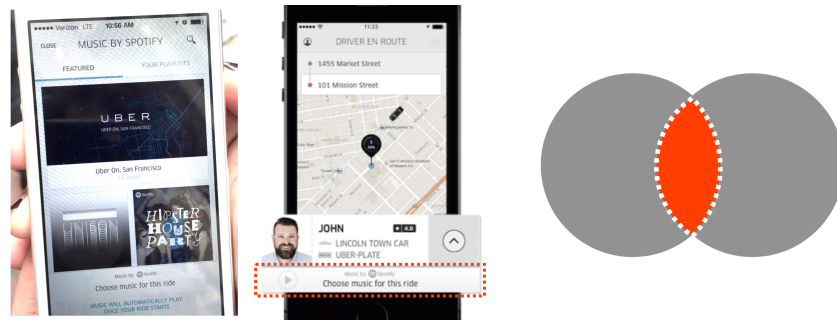


Figure 2. Uber and Spotify - model of featuring services

The third kind of entangled services are *liaising services*. Services are entangled in a way that reduces the friction a user experiences as they move between different services. Users see these services as helping to choose their next course of actions in an experience. For example, when a user books a flight ticket through Priceline [6], it shares links to other services such as available hotels and rent cars according to the itinerary. Liaising services focus on user's hand-off interactions with other services that would happen after user's core action.

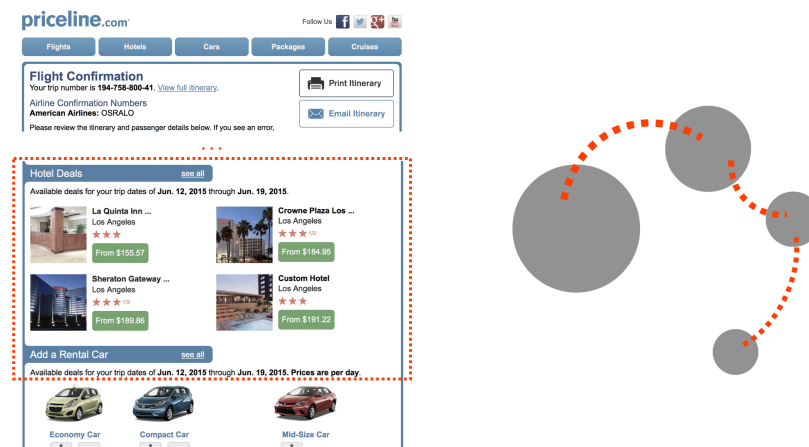


Figure 3. Priceline - model of liaising services

Normann's framework is useful to understand how services could become entangled. Information technology enables liquefaction of offerings, leading to increased unbundability and rebundability [2]. Through the unbundling and rebundling, values are co-produced by interactions of services and customers [7], not just delivered from providers to end-users or customers.

5. Uber – Spotify: <https://get.uber.com/spotify>.

6. Priceline: <http://priceline.com>

7. Richard Normann and Rafael Ramirez. 1993. Designing interactive strategy. Harvard business review, 71(4), 65-77.

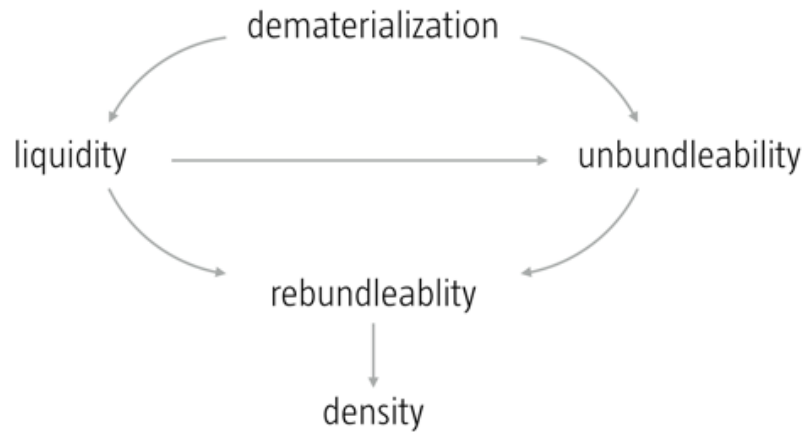


Figure 4. Drivers promoting density [2]

A key factor enabling unbundling and rebundling of entangled services is a value flow benefiting multiple stakeholders. In the Facebook Connect example, using the Facebook's sign-up process produces increased values to all stakeholders involved. The process of user registration was *unbundled* in the third party company's process. For third parties, the entanglement reduces development costs and might increase the user sign-up rates. For users, it provides simplified interactions in the registration step. For Facebook, it creates leverage with many other service companies by providing an essential process. It is *re-bundled* through the design and development activities of Facebook and third party services, as well as user's action of signing up with Facebook Connect.

In the Uber and Spotify example, value emerges from the experience of delivering personalized experience by listening to one's playlist in the car. Spotify *unbundled* user's playlist by making data accessible and usable by Uber system. Uber *rebundled* the data through a featured service that users and drivers can interact in the apps. The two services co-produce an increased value from the entanglement. Uber could provide more tailored passenger experience and Spotify could gain user-retentions through the entanglement.

These entangled services create unexplored areas for interaction designers. In my experience of working with designers and as a designer in technology companies, it was hard to capture the intersections of multiple services that might co-produce values since designers often work within and for a system, not across systems. Many of current interactive systems are designed with User Centered Design approach. User Centered Design has been good for understanding and creating a relationship between computational system and a user. However, it does not necessarily let interaction designers consider design opportunities outside realm of users and a system they design for. Service Design framing might be appropriate to entangled service as it aims to understand and coordinate multiple relationships constructing service

encounters. A new perspective, blending User Centered Design and Service Design, could be beneficial for advancing research on entangled services.

In order to investigate design for entangled services, I conducted interviews with interaction and service designers working in technology-based service companies. The interview showed that there are no design approaches concerning problems or opportunities across multiple services. It suggested an opportunity space of design inquiry; if and how designers identify entanglements and create futures with them. Series of co-design workshops were conducted to probe the questions of designing entangled services. Findings suggested designer's fixation to user values and lack of taking perspectives of services to be entangled. The investigation gives implications for Interaction and Service Design education and research that we may need to explore stakeholders-centered perspective to complement user centered design approach for better prepare designers working in complex systems where multiple services and stakeholders co-produce values.

## RELATED WORK

I examined related work in the domains of User Centered Design, Experience Design and Service Design.

### User Centered Design

User Centered Design (UCD) focuses on developing one product for a user. One popular method of UCD is Persona. Persona consolidates archetypal descriptions of user behavior pattern into representative profiles, to humanize design focus, test scenarios, and aid design communication [8]. Another popular methods in UCD is Scenario. A scenario is a believable narrative, usually set in the future of a person's experience as she engages with a product or a service [9]. They originated from designer's needs to synthesize and communicate design research for software development [10]. UCD binds designer's position into a context of a singular relationship with a user of a computational system. It does not necessarily give designers chances to discuss design issues of entangled services, particularly in a work setting where designers collaborate with multidisciplinary experts.

### Experience Design

Designing the user experience for interactive systems is complex when conducted by a team of multidisciplinary experts [11]. The key argument in Experience Design is that designers can design conditions for experience, not the experience itself [12] [13] because of the complexity of how an experience unfolds itself with multiple interactions of people, products, services and context. This construct provides an opportunity of bridging the single relationship orientation of UCD and multiple relationships orientation of Service Design, which I will discuss shortly.

### Service Design

A service can be thought of as a set of choreographed interactions between a customer and service provider [14] [15]. Unlike UCD, service design is interested in design opportunities across many different touchpoints that make up a service encounter [16].

Service design is represented through conceptual models, which describes aspects of the situation to be designed for, often abstracting reality to create clarity of focus [16]. One most adopted method in practice is Service Blueprint [14] [17], an abstraction of how multiple components of a service system need to be coordinated. In Operations Research and Management practices, service blueprinting is mainly used to control and optimize processes of service delivery. However, in Design and HCI community, service blueprinting is often used to describe a future state of a system and coordinate multidisciplinary team towards the envisioned future state. For example, a service blueprint model developed in a research project

8. Alan Cooper. 1999. The inmates are running the asylum: Why high-tech products drive us crazy and how to restore the sanity (Vol. 261). Indianapolis: Sams.

9. Thomas Erickson. 1995. Notes on design practice: stories and prototypes as catalysts for communication. In Scenario-based design, John M. Carroll (Ed.). John Wiley & Sons, Inc., New York, NY, USA, 261-268.

10. Bruce Hanington and Bella Martin. 2012. Universal methods of design. Rockport Publishers.

11. Jodi Forlizzi and Katja Battarbee. 2004. Understanding experience in interactive systems. In Proceedings of the 5th conference on Designing interactive systems (DIS '04). ACM, New York, NY, USA, 261-268.

12. Ezio Manzini and Cullars John. 1992. Prometheus of the Everyday: The Ecology of the Artificial and the Designer's Responsibility. Design Issues: 5-20.

13. Jodi Forlizzi. 2012. The Product Service Ecology: Using a Systems Approach in Design. In Proceedings of the 2nd conference on Relating Systems Thinking and Design (RSD2). Oslo, Norway.

14. Bitner J. Mary, Amy L. Ostrom, and Felicia N. Morgan. 2008. Service blueprinting: a practical technique for service innovation. California Management Review 50(3), 66.

15. Hugh Dubberly and Shelley Evenson. 2010. Designing for Service: Creating and Experience Advantage. [http://www.dubberly.com/articles/designing\\_for\\_service.html](http://www.dubberly.com/articles/designing_for_service.html). Accessed Aug, 2015.

16. Jodi Forlizzi and John Zimmerman. 2013. Promoting Service Design as a Core Practice in Interaction Design. In Proceedings of 5th IASDR World Conference on Design Research.

17. Shostack G Lynn. 1982. How to design a service. European Journal of Marketing, 16(1), 49-63.



investigating a futuristic robotic service describes how technology could create adaptive relationship with people through personalization [18].

Another common method in service design is Customer Experience Journey. Experience journey is a diagram illustrating customer's sequential interactions and touchpoints in an experience of a service. It conveys core concepts of Experience Cycle model, describing the steps customers go through in building a relationship with a product or service [19]. Experience journey is usually combined with service blueprinting in practice. While service blueprint is good for laying out organization's resources and processes needed for service delivery, experience journey is good for describing customer's actions, thoughts and emotions and how they unfold over time in an experience [20]. Experience journey covers multiple touchpoints well while service blueprint is more focused on description of single service system [21]

Both service blueprint and experience journey allow designers to identify multiple components and their interrelationships constructing a service encounter. However, understanding entangled services requires identifying relationships across different services and systems.

Designers are required to look outside of the system they work within when they tackle societal problems. In this case, designers create stakeholders map or service ecology map to sensitize outer forces and complex relationships that might impact to design and design space. Giga Mapping [22] is an example of such method intending to capture multiple boundaries of systems and prepare a condition where resolution could emerge, not manufacturing a solution responding to a problem. A similar approach could be taken into consideration when developing an approach for entangled services.

For the example with Facebook Connect, a User Centered Design process would enable interaction designers to create a stand-alone user registration process but does not necessarily give designers the option of interlinking Facebook or not. Experience Design approach would widens the design space to consider how an experience unfolds with multiple interactions. Service Design methods could be beneficial in design and research of entangled services because of its systemic approach and multiple-relationship orientation.

18. Hugh Dubberly and Shelley Evenson. 2010. Lee, M.K. and Forlizzi, J. 2009. Designing Adaptive Robotic Services. In Proceedings of IASDR09. New York, NY: ACM Press.

19. Hugh Dubberly and Shelley Evenson. 2008. The Experience Cycle. <http://www.dubberly.com/articles/interactions-the-experience-cycle.html>. Accessed Aug, 2015.

20. Chris Risdon. 2011. The Anatomy of an Experience Map. <http://www.adaptivepath.com/ideas/the-anatomy-of-an-experience-map>. Accessed Aug, 2015

21: Shahrzad Samadzadeh. 2015. Customer Journey Map or Service Blueprint? <http://www.cooper.com/journal/2015/5/journey-map-or-service-blueprint>. Accessed Aug, 2015

22. Birger Sevaldson. 2011. Giga-mapping: visualisation for complexity and systems thinking in design. In Nordes (4).

## **PROCESS**

The investigation of entangled services was made during a nine month period as a thesis project for a master's degree in interaction design. It was compressed into the following phases:

### **Literature Review**

I reviewed literature of User Centered Design, Experience Design and Service Design. Needs for listening interaction and service design practitioner's voice have emerged to better understand the current state of designing entangled services and investigate the state-of-the-art designing for them if there are any.

### **Interviews**

I conducted nine interviews with designers to learn the current state of designing entangled services. Interview data was collected by recording and note-taking and analyzed by affinity mapping. The findings suggested an opportunity space for design inquiry of entangled services.

### **Workshops**

I organized co-design sessions letting designers articulate the current state of entangled services and conceive of future designs with entanglements. Five workshops were conducted with eight design and HCI students. Workshop data was collected through observation, recording, and post-workshop interviews and analyzed by and affinity mapping. The findings produced insights on designing entanglements and implications for interaction and service design education.

## INTERVIEWS

There were two goals in the interview. 1) To understand if and how current interaction and service design practitioners consider entangled services in their design process. 2) To see if current interaction and service design practitioners feel that they need new tools and methods to help design service entanglements.

### Methods

Nine conversational interviews were conducted by phone and lasted 45 minutes in duration. Participants had all practiced interaction or service design for more than three years. Four worked as design managers. All participants were working in an in-house design team for an organization offering technology-based product service systems to end users or customers. All participants had bachelors or master's degrees in design.

	Domain of Service (described project)	Role
P1	Online lodging marketplace (host solutions)	Interaction Designer
P2	Transportation brokerage (driver solutions)	Senior UX Designer
P3	Internet search (recommendation application)	Interaction Designer
P4	Social media (contents viewing)	Product Designer
P5	Internet search (communication application)	Interaction Designer
P6	Social commerce	Vice President, Design Group
P7	Wearable solutions	Senior Product Designer
P8	Healthcare solutions	Senior Service Designer
P9	General Hospital	Senior Service Designer

*Table 1. Interview participants*

Through the interviews, I asked participants about their design process for entangled services or interfaces lying in the intersection of multiple services. Participants were asked to share one or two specific project example. Within the shared project context, I probed process of designing for entangled services and its challenges. Interview protocol can be found in the appendix. Interview data was collected by recording and note taking. The data was analyzed by affinity mapping.

## Findings

The interviews collectively described the current state of designing entangled services in interaction and service design. Participants could not identify entangled services in their design processes. Participants did not have design methods for entangled services as well.

Participants could not identify entangled services in their design processes. When I asked about entangled services, participants mainly answered how multiple stakeholders or multiple internal systems might influence their design. Participants did not mention how to design for third-party services.

*“ It is challenging because it (designing healthcare solutions for general hospitals) involves larger stakeholders. We need to know regulations, policies, and stakeholders’ strategic positions to the current changes in healthcare. It requires design team quick design decision-making because there are so many uncertainties. It causes extra iterations in design execution because we don’t know what will exactly happen in the complex landscape.”*

– P8 (service design, healthcare solutions)

Designing for entangled services was not a conventional interaction or service design activity. Some participants claimed that designing entangled services is not the role of designers and addressed by other functions in the organization.

*“ What third party application information to be displayed in the Timeline was defined in meetings with product managers in charge of partnerships with the application categories. We had a lot of discussions on how much and what kind information from music or game apps we want to show in relation to portions of personal postings. ”*

– P4 (interaction design, social media)

*“ I wonder if designing interconnections across many systems is something that interaction designers are allowed to, or maybe even want to do. For me, it sounds like a job of a CEO of a company. ”*

– P5 (interaction design, internet search)

*“ API level design features should be more consciously designed, rather than engineered day to day. At first it didn’t seem to be important. But I realized when you really want to design the whole experience well, you need to envision high-level future of how our back-end systems should interface with our third party applications right.”*

– P7 (product and interaction design, wearable solutions)

There were no adopted design methods allowing designers to identify values that would rise from the intersections of multiple services. Some participants answered that they are dealing with dependency of multiple internal systems. However, no participants reported that they have considered external services in their design process.

*“ Working tightly with the Customer Support team was very helpful for identifying important interdependencies that would rise in the future. It helped me think of impacts when changes made by customers or hosts. Voice of Customers glued many independent designs of customer-side and host-side into a seamless one – we found having CS team in our daily scrum very useful in this sense.”*  
– P1 (interaction design, online lodging marketplace)

*“As we shift our focus from developing medical solutions to health solutions, we found the hardest part we face everyday is capturing and resolving issues from interdependency of systems. The interdependency lies in many different legacy (health information) systems, care practices, facilities and associated policies.”*  
– P9 (service design, healthcare provider)

In conclusion, there was little awareness of entangled services revealed in the interviews with designers. This suggests an empty space for design research addressing entangled services and capturing intersections of multiple services that might co-produce values.

Interviews also suggested that designing for entangled services might not be a designer's job. This contrasts with expanded roles that designers play in organizations and society. In the interview, participants told that they work across internal systems or multiple functions to resolve issues of interdependencies impacting their design. There are also designers who have created and leading AirBnb, an online lodging marketplace service where hosts and travelers are entangled in co-production of values [23]. These show designer's capability of imagining systems and actions surrounding designed artifacts, which goes beyond the designer's traditional role of creating standalone artifacts. Management or business functions in an organization might have concerned the issue of entangling services as some participants suggested. However, I speculate designers might be able to do this as well or maybe even better with design skills and human centered design perspective.

The findings motivated development of design activities to understand if and how designers could a) identify entangled services and b) enable unbundling and rebundling multiple services as a resource for service entanglements in familiar context.

23. Sarah Kessler. 2012. How Snow White Helped Airbnb's Mobile Mission. <http://www.fastcompany.com/3002813/how-snow-white-helped-airbnbs-mobile-mission>. Accessed Aug, 2015.

## WORKSHOPS: LIQUEFYING SERVICE ENTANGLEMENTS

I devised co-design workshops to learn designers' natural inclinations and reactions for designing entangled services. The goals of co-design workshops were 1) to help designers to identify entangled services in a familiar context and 2) to examine possibilities of conceiving future designs through unbundling and rebundling of services. I took following steps for design of workshop activities.

### Setting Context

I chose traveling as the context for co-design workshop. People naturally interact with many kinds of services online and offline during their journey, therefore I thought it would be appropriate.

### Preparing Models for Entangled Services

I could learn from interviews that a concept of entangled services might be a new one to many designers. Therefore, I created models that might help designers become sensitized to entangled services during the workshop. Sketching my own traveling experience to Norway in Fall 2013 gave me inspirations.

Yellow circles represent bundles of many services (red and purple filled circles) that I have interacted for various purpose; such as ticketing (Kayak, Priceline, Conference Website), sharing (Evernote, Facebook) and Informing (Wikipedia, Medium)

I sketched each service bundle on different sheets of tracing paper. When I overlapped them, I could see a possibility of an entangled service allowing me collecting written reflections of a trip. In this idea, the entanglement could be made with re-bundling of Facebook, Evernote, Wikipedia and Medium (represented with green line)

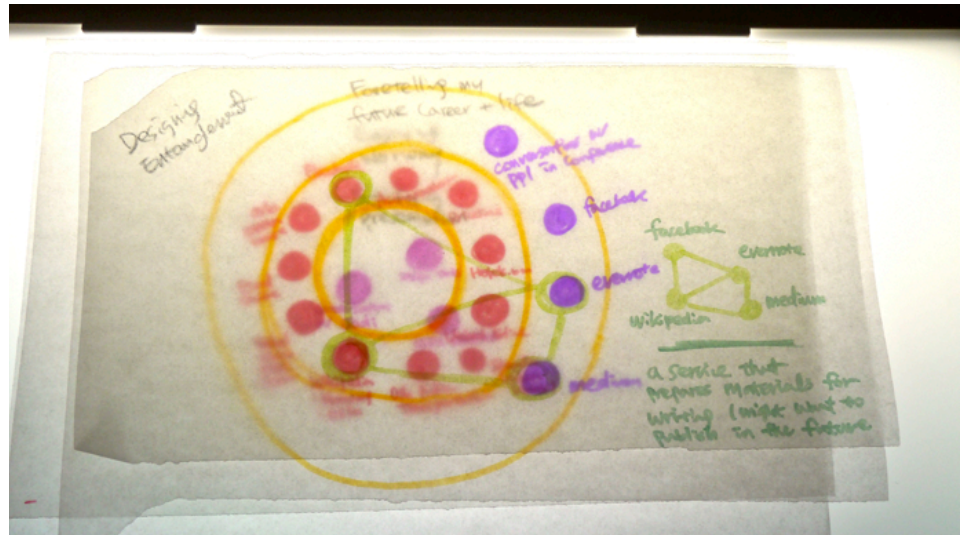


Figure 5. Photos of prototypes

I used everyday materials that can be found in design studios such as post its, tracing papers and light boxes. Providing physical aid than digital seemed appropriate for workshop because activities will require participants deal with many intangible services in a past experience. Having a physical experience in workshops would let designers more engage to the topic and make design activities with intangibles more accessible and comfortable.



time

start

end

services

others

people

place

product

Participants sketch services and others components of a trip experience (represented with circles or boxes) alongside to time

[illegible]

17

Participants use unbundled services in creation of rebundled clusters for an experience

Participants articulate what are each rebundles for and move circles (services constructing a rebundle) around for iterative sense-making

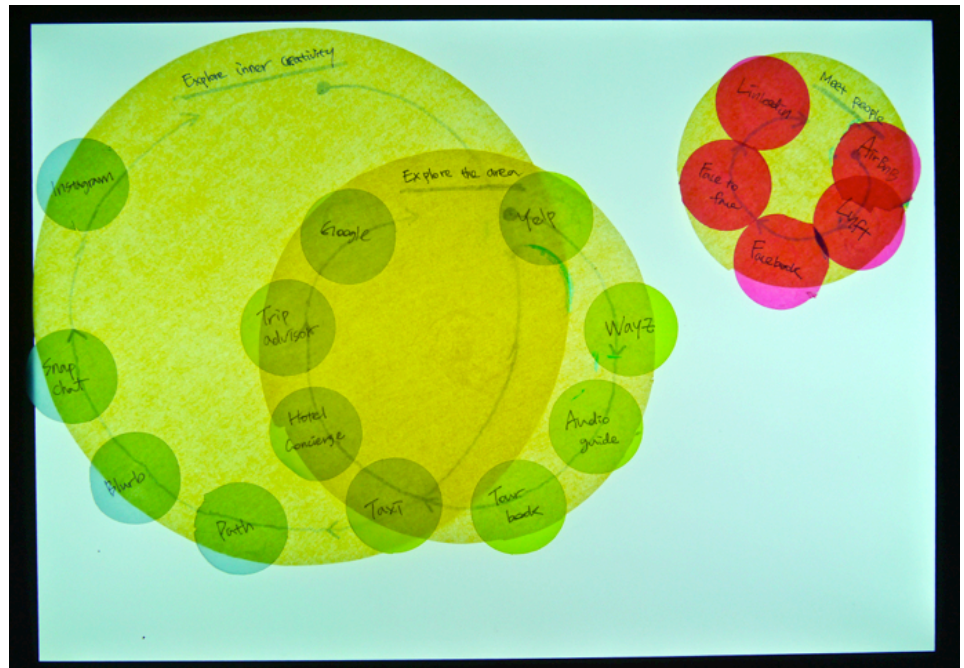


Figure 8. Model for rebundling (1)

Participants overlap rebundles on the unbundling sketches and iteratively articulate future designs

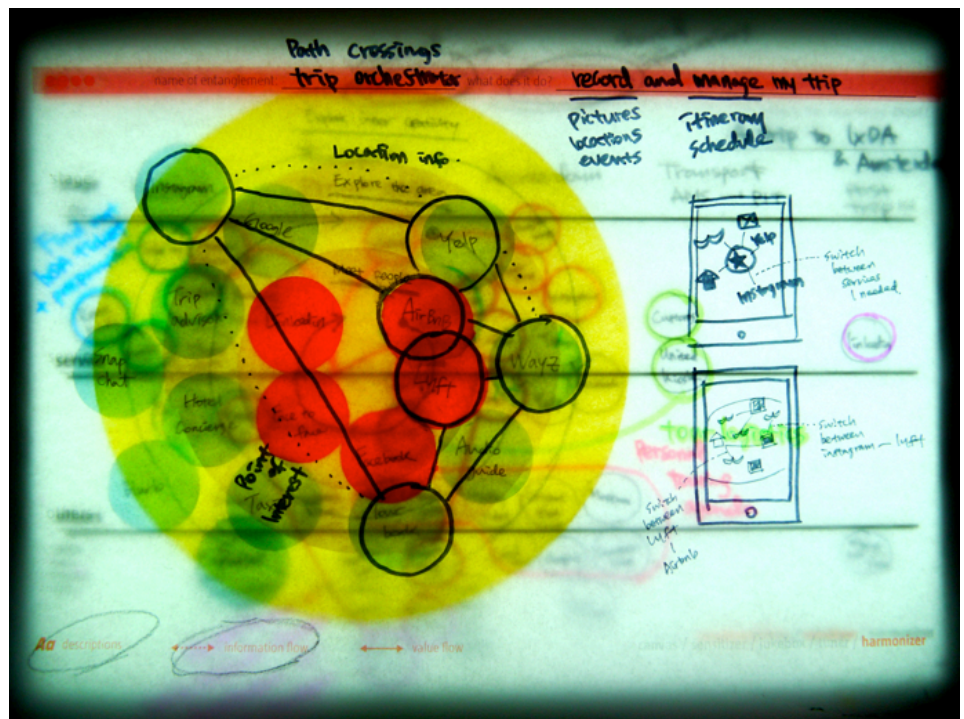


Figure 9. Model for rebundling (2)

## Co-design Sessions

Two phases of co-design workshop were prepared. The first phase was to *deconstruct* a recent travel experience with unbundling activity. The second phase was to *reconstruct* a future-state of the experience with rebundling activity.

### Deconstructing

Designers were invited to remember a recent travel experience and asked to decompose it into time, services and others (people, places, products). The goal of *Deconstructing* is to see if and how participants unbundle multiple services and identify inter-linkages of them as a customer in an experience. Detailed activities in this phase are following:

- A. Remember an experience
- B. Decompose the experience with time, services, others (people, place, products)
- C. Identify interrelationships among the components

Participants are deconstructing an experience with services



Figure 10. Photos of Deconstructing (1)



Participants identified interrelationships through interconnecting components and adding annotations



Figure 11. Photos of Deconstructing (2)

Participants identified interrelationships through clustering components

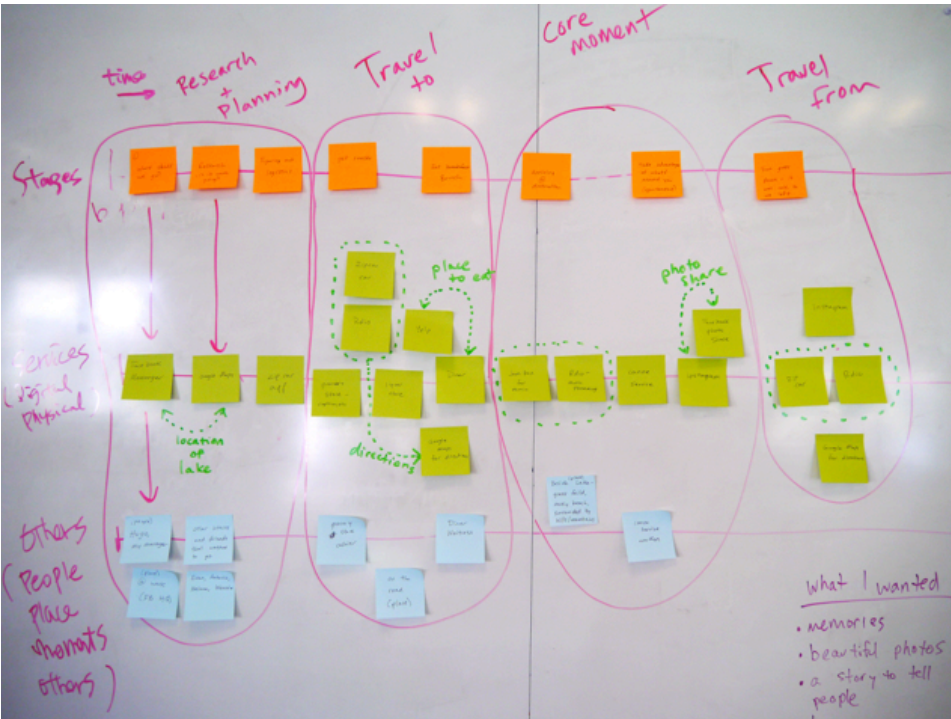


Figure 12. Photos of Deconstructing (3)

## Reconstructing

After *Deconstructing* activities, designers are invited to conceive an ideal traveling experience. The goal of *Reconstructing* is to see if and how participants conceive a future state with entanglements. Participants were asked to rebundle services that they decomposed at the prior activity through creating clustered abstractions of future states. Detailed activities in this phase are following:

- A. Think of pain points in the past trip experience or imagine an ideal trip experience
- B. Rebundle the decomposed elements
- C. Iteratively define future designs with rebundled clusters

Participants sketched rebundled services for future design



Figure 13. Photos of Reconstructing (1)

Participants defined rebundled clusters through describing what each bundle is for and moving component services (represented with small circles) across other bundles



Figure 14. Photos of Reconstructing (2)

Participants articulated rebundled services through adding annotations and think aloud

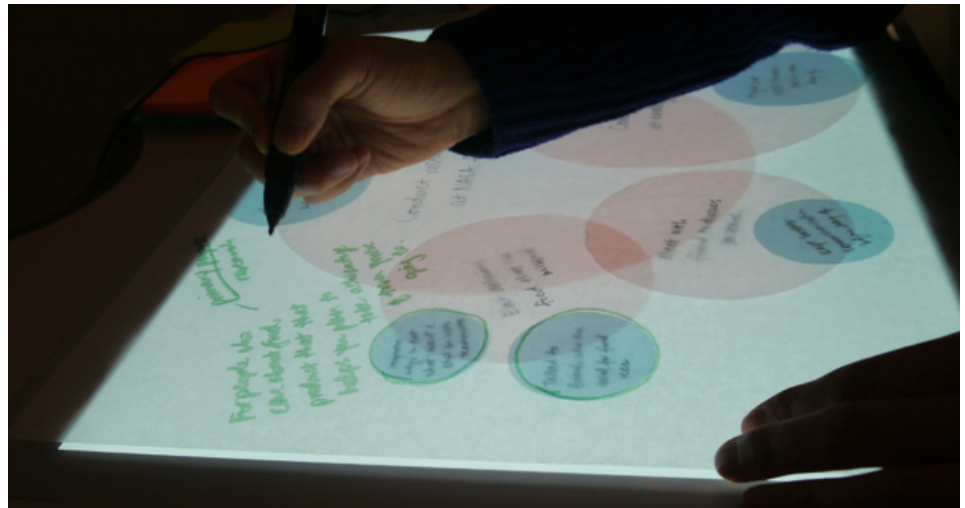


Figure 15. Photos of Reconstructing (3)



## WORKSHOP RESULTS

Five co-design workshops were conducted with eight design and HCI students. Among the five sessions, two included multiple participants and they used a group travel experience for the workshop. Workshop data was collected through observation, recording, note-taking and post-workshop interviews. The data was analyzed by affinity mapping.

Session	Participants
W1	P1 (f, 26); HCI graduate student
W2	P2 (f, 25); Communication Design graduate student
W3	P3 (f, 28), P4 (f, 26), P5 (m, 25); Interaction Design graduate students
W4	P6 (m, 23); Product Design undergraduate student
W5	P7 (f, 28), P8 (f, 25); Interaction Design graduate students

*Table 2. Workshop Participants*

Activity	Average Time Spent
Introduction	5 min.
Decostructing	Solo: 40 min. / Group: 60 min.
Reconstructing	Solo: 20 min. / Group: 30 min.
Post-workshop interview	30 min.

*Table 3. Workshop activities and average time spent*

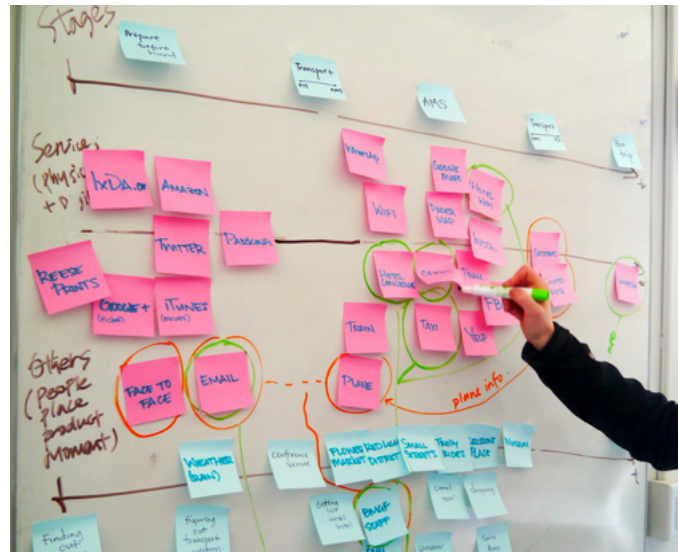
## Findings

The workshop showed that participants could identify entangled services and design opportunities in a decomposed experience. However, participants struggled in rebundling. Participants who could conceive future designs with rebundled services described the entanglement only from the user's perspective.

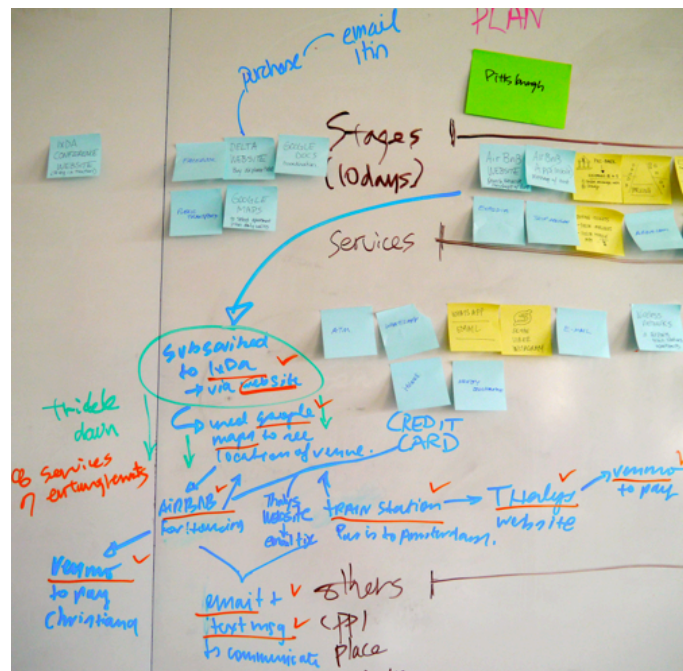
In Deconstructing phase, Participants started identifying entangled services. Realizing density of services in an experience often facilitated the process.

*P2: "I did not realize I have used such many apps and services in just three days"*

(W5) Participants sketched how services are interconnected and clustered



(W3) Participants annotated how an interaction with one service triggered another interactions with others



While sketching interconnections, participants could identify inter-relationships among multiple services. Dependent, featuring and liaising relationships of services were described.

P1: "I feel like everything was connected with Gmail and Google Calendar. It was a busy trip with teammates and there were lot of things to coordinate. When I found a lunch or dinner place at Yelp, I immediately turned on Google Calendar and put the info there so my teammates could know where I will be." – dependent services

P2: "Including me, people traveled to IxDA used Whatsapp because it is free of charge. So this (Whatsapp) connects to Google Map and Calendar because we frequently exchanged our schedule and location info for where to eat, where we stay and where people are at during the conference." – liaising services

P6: "(describing lines connecting Rdio and Jambox / Rdio and Zipcar) listening music together was an important part of our trip. We used Rdio to stream music in the car we rented at Zipcar. When we were hanging out at the lake, we used Jambox to stream music from Rdio." – dependent services

P6: "(describing a line connecting Instagram and Faceook) We usually took photos with Instagram app. When I want to share pictures at my Facebook timeline, I used Facebook Photo sharing button in the Instagram." – featuring services

One participant group realized an interconnection of two different services in the deconstructing activity. They guessed an unseen information exchange that might interlink the two services.

P3: "When we searched for the bookstore location at Google Maps, the Google Map showed our Airbnb place in the map so we could realize the bookstore was not too far from the house."

P4: "How did the Google Maps already have our location at that time? That's spooky."

P3: "I don't know... maybe Google detected location information from the confirmation email from Airbnb?"

In the phase of Reconstructing, participants generally struggled with conceiving future designs with entanglements, although some of them could see design spaces for entangled services. The design spaces were mainly about reducing frictions of using multiple services.

P1: "I want a calendar that automatically updates my status to all other services and team members. It can also give me wise recommendations of places to eat or visit. I don't want to use emails for doing this. "

P4: "Sharing photos after trip was complicated. We created a sharing folder at Dropbox and three of us threw all photos we took there. I wanted to post some of photos we took at Facebook, not all of them. I had to switch between Dropbox and Facebook many times for this."

P5: "I feel like LinkedIn and IxDA conference websites can be more connected. I switched the LinkedIn App and the conference website a lot on my phone to get to know people I met during the conference day."

Among the five workshops, two groups could conceive future designs with rebundled services. Both groups described the entangled services as a future state from the user's perspective. They did not articulate why the services can be entangled from the perspective of values that services could gain. I illustrate two groups' responses below.

(W4) In this rebundling, participant highlighted an interconnection of Rdio, a music streaming service and Zipcar, a rental car service



Figure 18. Rebundling (1)

One participant was particularly interested in rebundling of music, rental car and map service because he recalled the core experience of the trip was listening music together with friends while they are traveling. After series of rebundling and sketching upon it, he highlighted an interconnection between Rdio, a music streaming mobile service, and Zipcar, a rental car service. He mentioned the two services could possibly be more connected, remembering

the painful pairing experience of the music application and car's bluetooth audio system. However, he could not describe how the two services could be entangled in further detail.

(W5) Participant illustrated a rebundled future service concept integrating four services that are unbundled at the *deconstructing* activity

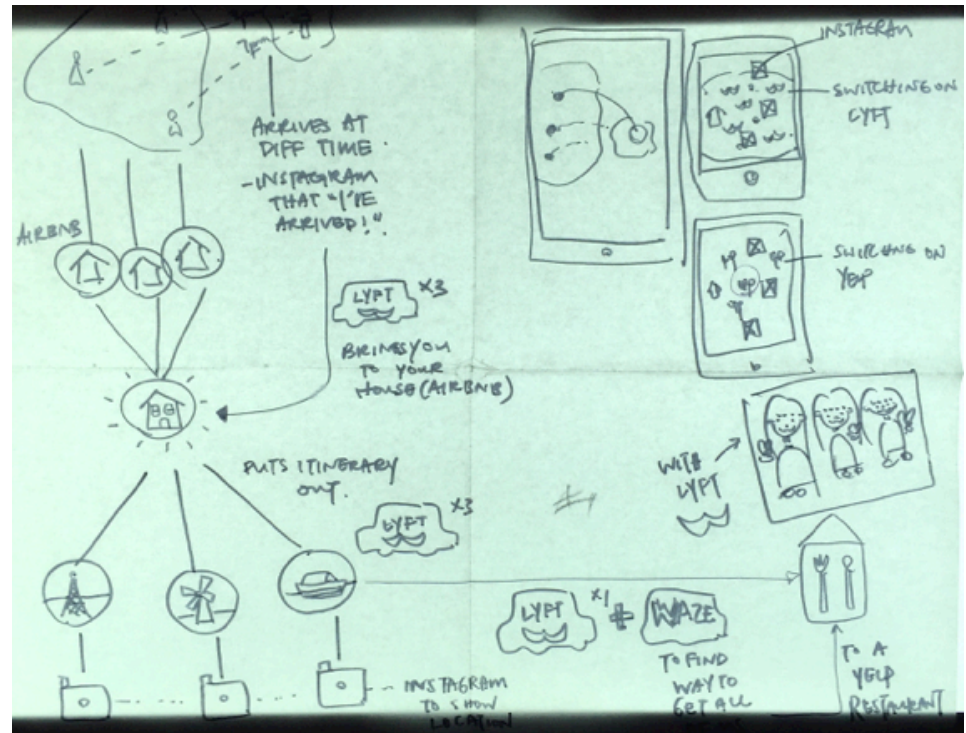


Figure 19. Rebundling (2)

Another participants illustrated a future service concept for a concierge service providing a personalized tour logistics of transportations and eating. The service concept integrated four services that participants have decomposed in the Deconstructing activity. Participants assumed that four services might be able to work together because of shared information (location) across the services. However, participants could not articulate why each service may want to share the information with others. Participants did not talk about if the shared information among the four services would provide enough conditions for an entangled service.

## DISCUSSION

The workshop revealed a challenge of designing entangled services; lack of identifying values-in-exchange. Participants identified and attempted to create entangled services based on user values (values-in-use), not the values that can be exchanged or co-produced by multiple stakeholders in an experience.

None of participants took the perspectives of the services that can be entangled during the workshop. Two groups who could conceive a future design with entanglements rebundled services from the perspective of end-users, not from the services that are entangled. For example, a rental car service will need incentives to be entangled with a music streaming service such as share of revenues or exposures of entangled services in each other. Sharing location information across four different services will require much more sophisticated design of value exchanges. Solely taking a user's perspective does not allow designers to capture and imagine these value flows intersecting multiple services.

Entangled services involve multiple stakeholders in value co-production. Taking a perspective of service can be equally import to taking user's perspective when design for entangled services because it provides a starting point of perceiving values-in-exchange. The workshop outcome shows that taking a user's perspective did not facilitate designing entangled services. It implies that designers might lack techniques for perspective taking of non end-user stakeholders, such as other service providers or customers in an experience.

The investigation suggest that designers might have been too much fixated to a user's perspective in design of an experience by the training that emphasizes understanding users and orienting design activities towards them. However, in complex settings such as traveling, getting discharged from hospitals or transferring to different care facilities, multiple services and stakeholders co-construct an experience and taking a user's perspective is not enough for shaping resolutions. In the evolution of Interaction Design education, wicked problems helped framing qualities of problems that designers deal with [24]. For design of entangled services, taking stakeholders centered perspective could be beneficial for the wicked problem – identifying and designing value flows intersecting multiple services and customers. These can be considered and further researched in the development of future Interaction and Service Design education.



## CONCLUSION

In this thesis, I presented an idea of entangled services and provided three kinds of entanglements with examples and illustrations. Through the interviews and co-design workshops, the state of the art of designing entangled services and challenges are described.

Designers are increasingly asked for creating resolutions in complex systems such as healthcare or education. Service offerings in these domains are co-produced by multiple stakeholders, services and practices. From the investigation of designing entangled services, I could speculate the user centeredness of current interaction and service design practices may not prepare designers for confidently navigating intersections of multiple services where values could be co-produced. Traditionally, user centered design approach have promoted designers creating tools people use to do tasks and works in single relationship of a user and a computational objects. However, in the landscape where services are entangled, we may need to complement user-centered design with stakeholders-centered perspective to aid identifying and imagining values-in-exchange with services, stakeholders and customers.

## REFERENCES

1. Facebook. 2008. Facebook Across the Web. <http://www.facebook.com/notes/facebook/facebook-across-the-web/41735647130>. Accessed Aug, 2015.
2. Richard Normann. 2001. Reframing Business: When the Map Changes the Landscape. West Sussex, England: John Wiley, 26-36.
3. Flipboard: <http://flipboard.com>
4. Kayak: <http://kayak.com>
5. Uber – Spotify: <https://get.uber.com/spotify>.
6. Priceline: <http://priceline.com>
7. Richard Normann and Rafael Ramirez. 1993. Designing interactive strategy. *Harvard business review*, 71(4), 65-77.
8. Alan Cooper. 1999. The inmates are running the asylum: Why high-tech products drive us crazy and how to restore the sanity (Vol. 261). Indianapolis: Sams.
9. Thomas Erickson. 1995. Notes on design practice: stories and prototypes as catalysts for communication. In *Scenario-based design*, John M. Carroll (Ed.). John Wiley & Sons, Inc., New York, NY, USA 37-58.
10. Bruce Hanington and Bella Martin. 2012. *Universal methods of design*. Rockport Publishers.
11. Jodi Forlizzi and Katja Battarbee. 2004. Understanding experience in interactive systems. In *Proceedings of the 5th conference on Designing interactive systems (DIS '04)*. ACM, New York, NY, USA, 261-268.
12. Ezio Manzini and Cullars John. 1992. Prometheus of the Everyday: The Ecology of the Artificial and the Designer's Responsibility. *Design Issues*: 5-20.
13. Jodi Forlizzi. 2012. The Product Service Ecology: Using a Systems Approach in Design. In *Proceedings of the 2nd conference on Relating Systems Thinking and Design (RSD2)*. Oslo, Norway.
14. Bitner J. Mary, Amy L. Ostrom, and Felicia N. Morgan. 2008. Service blueprinting: a practical technique for service innovation. *California Management Review* 50(3), 66.
15. Hugh Dubberly and Shelley Evenson. 2010. Designing for Service: Creating and Experience Advantage. [http://www.dubberly.com/articles/designing\\_for\\_service.html](http://www.dubberly.com/articles/designing_for_service.html). Accessed Aug, 2015.

16. Jodi Forlizzi and John Zimmerman. 2013. Promoting Service Design as a Core Practice in Interaction Design. In Proceedings of 5th IASDR World Conference on Design Research.
17. Shostack G Lynn. 1982. How to design a service. *European Journal of Marketing*, 16(1), 49-63.
18. Hugh Dubberly and Shelley Evenson. 2010. Lee, M.K. and Forlizzi, J. 2009. Designing Adaptive Robotic Services. In Proceedings of IASDR09. New York, NY: ACM Press.
19. Hugh Dubberly and Shelley Evenson. 2008. The Experience Cycle. <http://www.dubberly.com/articles/interactions-the-experience-cycle.html>. Accessed Aug, 2015.
20. Chris Risdon. 2011. The Anatomy of an Experience Map. <http://www.adaptivepath.com/ideas/the-anatomy-of-an-experience-map>. Accessed Aug, 2015
21. Shahrzad Samadzadeh. 2015. Customer Journey Map or Service Blueprint? <http://www.cooper.com/journal/2015/5/journey-map-or-service-blueprint>. Accessed Aug, 2015
22. Birger Sevaldson. 2011. Giga-mapping: visualisation for complexity and systems thinking in design. In Nordes (4).
23. Sarah Kessler. 2012. How Snow White Helped Airbnb's Mobile Mission. <http://www.fastcompany.com/3002813/how-snow-white-helped-airbnbs-mobile-mission>. Accessed Aug, 2015.
24. Richard Buchanan. 1992. Wicked Problems in Design Thinking. *Design Issues*: 5-21.

## APPENDIX

### Interview questions

Thank you for taking the time to talk with me today. The interview will take 45 minutes. Would you mind recording our conversation? (Yes to recording). Thank you. You can always stop the recording during the interview.

Q1. Could you briefly tell me about your work experience and educations till now? You don't have to tell me names of institutions, organizations or projects.

Q2. Could you give me one example of project in your workplace that you have designed a service, service features or interfaces interconnected with other services?

Q3. Could you walk me through the design process that you took at the project?

Q4. Could you tell me any design methods or approaches that you have used during the project?

Q5. Could you tell me if there were any challenges that you have faced during the project? Please tell me more about the experience.

Q6. How did you prototype your designs during the project?

Before we wrap up, is there anything that you think I should have asked to you but I did not?