

Mobile First? Understanding Device Usage Practices in Novel Content Sharing Services

Anton Fedosov

Università della Svizzera italiana (USI)
Faculty of Informatics
Via G. Buffi 13
6904 Lugano, Switzerland
+41 58 666 4758
anton.fedosov@usi.ch

Jarno Ojala

Tampere University of Technology
Human-Centered Technology
P.O. Box 589, 33101 Tampere,
Finland
+358 40 849696
jarno.ojala@tut.fi

Evangelos Niforatos

Università della Svizzera italiana (USI)
Faculty of Informatics
Via G. Buffi 13
6904 Lugano, Switzerland
+41 58 666 4322
evangelos.niforatos@usi.ch

Thomas Olsson

Tampere University of Technology
Human-Centered Technology
P.O. Box 589, 33101 Tampere,
Finland
+358 40 8490919
thomas.olsson@tut.fi

Marc Langheinrich

Università della Svizzera italiana
(USI) Faculty of Informatics
Via G. Buffi 13
6904 Lugano, Switzerland
+41 58 666 4304
marc.langheinrich@usi.ch

ABSTRACT

Today's mobile app economy has greatly expanded the types of "things" people can share – spanning from new types of digital content like physiological data (e.g., workouts) to physical things like apartments and work tools ("sharing economy"). To understand whether mobile platforms provide adequate support for such novel sharing services, we surveyed 200 participants about their experiences with six types of emergent sharing services. For each domain we elicited device usage practices and identified corresponding device selection criteria. Our analysis suggests that, despite contemporary *mobile first* design efforts, desktop interfaces of emergent content sharing services are often considered more efficient and easier to use – both for sharing and access control tasks (i.e., privacy). Based on our findings, we outline device-related design and research opportunities in this space.

CCS Concepts

• **Human-centered computing** → **Social content sharing** • **Human-centered computing** → **HCI design and evaluation methods** • **Human-centered computing** → **Ubiquitous and mobile computing design and evaluation methods** • **Human-centered computing** → **Empirical studies in interaction design** • **Security and privacy** → **Usability in security and privacy**.

Keywords

Content sharing; online sharing services; device usage practices; device selection criteria; design guidelines; mobile devices; privacy management.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.

AcademicMindtrek'16, October 17 - 18, 2016, Tampere, Finland
Copyright is held by the owner/author(s). Publication rights licensed to ACM.

ACM 978-1-4503-4367-1/16/10...\$15.00

DOI: <http://dx.doi.org/10.1145/2994310.2994317>

1. INTRODUCTION

The explosive growth of social networking services in recent years has led to a vast amount of user-generated and user-mediated shared content, mostly in the form of personal media (e.g., photos, music, videos) and corresponding social metadata (e.g., comments, ratings, status updates). Earlier research has extensively explored needs, practices and concerns surrounding the sharing of photos, videos, and documents. However, various recently emerged services and connected devices have greatly expanded the set of "things" to share. With services like Spotify, Foodspotting, Endomondo, Airbnb, and Uber, shared content today ranges from preferences and tastes (e.g., playlists) to personal physiological data (e.g., workouts), and beyond to real-world artifacts (e.g., accommodation and car sharing).

Personal devices such as smartphones and wearables, with their rich set of networking capabilities and sensors, have made it possible to capture, record, and share those novel types of digital content. The last few years have in fact seen a dramatic shift towards using mobile devices in tasks related to the digital creation and consumption of content. Today, mobile platforms have overtaken the traditional desktop interfaces' dominance as a primary gateway to the Internet [25], prompting design practitioners and researchers to call for *mobile first* Web design, i.e., designing Web sites so that they better accommodate the needs of mobile Internet users [42].

We wanted to understand whether and how the mobile shift also occurs with respect to novel content sharing services. The question of device preference is particularly relevant in these services where the shared data is often created while being mobile (e.g., run logs or images). Contemporary mobile apps and online services broadly employ "social" buttons (e.g. "Tweet", "Post on Facebook"), which makes user-generated content easier to produce albeit harder to maintain. As a result, users may (a) develop a fear of oversharing, since many mobile sharing apps – after an initial setup – often share a user's activity *automatically* (e.g. workout statistics); and (b) lose control over information dissemination, as obscure access control and audience management mechanisms make it difficult to understand who can read what.

Using an online survey tool, we solicited feedback from 200 participants who had experience with at least one emergent sharing service with respect to their current and past device usage practices. We focused our study on six emergent types of content sharing services: (1) sharing music preferences and playlists; (2) travel plans and trip details; (3) details of physical exercises and sports activity; (4) personal physical possessions such as apartments, vehicles, or work tools (“sharing economy”); (5) virtual possessions in video games and virtual social worlds, and (6) personal culinary and dietary preferences. The particular choice of service categories is based on an initial literature review, which allowed us to scope the research area (see “Related Work” section). To the best of our knowledge, no prior study has investigated and compared device preferences to access such novel sharing services. Understanding whether mobile and desktop platforms provide adequate support for such services is crucial for design of future services that enable effective content sharing from multiple users’ devices. This study targets to fill this gap.

Specifically, we aim to understand three aspects with respect to emergent sharing services:

1. Elicit device usage practices for understanding the effect of device selection on how a service is used.
2. What are device selection criteria for accessing a service?
3. How efficient and easy are mobile devices compared to their desktop counterparts for a particular type of service?

Ultimately, our work attempts to offer insight into designing content sharing services for easy and effective use. In addition, our work also investigates “audience management”, i.e., who sees what content. This includes strategies for both “audience limiting” (to prevent unwanted access) as well as “audience reaching” (to approach the wanted audience in its entirety) [27, 28]. To this end, our survey gathered responses on how users perceived the possibilities to control the audience of a shared content item with different devices.

After discussing related work below, we will describe our study design in detail. Then, we present the resulting factors that influenced our participants’ choice of device to access a particular type of service, supported by qualitative and quantitative analyses. Finally, we discuss similarities and differences of device usage across the six different emergent sharing domains we surveyed.

2. RELATED WORK

2.1 Studies of Device Usage

Prior work has looked at internet use on smartphones [37] and tablets [31], as well as cross-device and multi-device use for everyday activities and tasks [19, 22, 35]. Our research extends this work by focusing on device selection for sharing content, especially when it comes to novel content types.

Research on mobile internet use has listed many problems and factors that challenge the use of mobile devices. Tossel et al. [37] compared native apps and web applications on mobile, and observed a much wider use of native apps. Böhmer et al. [8] describe a large dataset on application use with mobile devices, also listing the most likely transitions between applications. Studies made during the time of first generation of smartphones list convenience, mobility, input efficiency and readability as the main factors that affect their use [20]. Karlson and others also found that mobile devices were often seen as a stopgap solution for situations when no PC was available. Kawsar and Brush [22] presented a mixed methods study on the use of different devices at home. They

present five key selection factors: screen size, portability, interaction available, always on, and usability. Their findings suggest that easiness to reach and initiate interaction on the device often overcomes form factor drawbacks, especially in the context of social media use. Their work also states that activity comes first and device next: a device selection is made to match the planned activity, and devices are changed even throughout a task in the home environment. That might not be the case outside home, where device availability plays a bigger role. Our work clarifies the reasons for device selection for content sharing activity.

A comparative study on the online use of PC’s and mobile devices by [21] suggests that similar services were used on both devices, but mobile devices limited service use because they had insufficient input and output capabilities. Mobile devices for content production have been studied by Bao et al. [5]. Their work discusses problems especially in text production, comparing subjective perception and real performance on text creation tasks with mobile devices. Today’s devices, however, have more developed interface capabilities, and our work discovers the current state of their usage for content sharing.

Tablet use has been researched in work by Muller et al. [31]. Their study uncovers a relatively high amount of content production with tablets, and suggest that tablet devices are preferable to PCs and laptops due to their easy initiation and their convenient form factors. A study by Santosa and Wigdor [35] identified specialized use cases for different devices in a multi-device setting, and showed how multiple devices changed the workflows of users. Our work extends the knowledge on identifying the tasks that users perceive laborious with a certain device and the identifying the device selections to access a certain sharing service.

2.2 Studies of Content Sharing

Sharing is a compound social phenomenon. While we all feel that we know what sharing means, John [18] distinguishes two logics behind the term – distributive and communicative. Sharing as an act of *distribution* could be simply described as dividing a piece of something to someone (e.g. a child shares a candy bar). Sharing can be also an act of *communication* when we talk about sharing our feelings and emotions. Furthermore, John [17] describes sharing as the fundamental and constitutive activity of Web 2.0 in general and online social networking services in particular. He argues that sharing phenomena in Web 2.0 are not necessarily novel (sharing is seen as a type of communication). However, rebranding these activities under the term *sharing* (e.g. photo sharing) and using networked technologies within these activities – are new phenomena [17]. Hence, we see the value in studying novel sharing practices in Web 2.0 to further our understanding of this emergent terrain. For our study, we selected six different types of emergent content sharing categories, which manifest both distributive and communicative logic of sharing.

A large number of studies on *sharing* in HCI focus on traditional personal digital content, such as photos [23, 29] and video [26]. Sharing music preferences has been studied extensively by Volda et al. [41]. Their work in 2005 studied how users share their listening preferences using iTunes. Aizenbud-Reshef et al. [3] studied the sharing of travel information by interviewing employees regarding their willingness to share their past and future travel plans. Prior work on sharing physiological data confirmed that sharing contributes to the overall user experience and enjoyment of workouts [30, 32]. Prasad et al. [34] studied preferences regarding the tracking (and potentially sharing) of personal health data and found out that some of the data is more

likely to be shared with unknown users rather than close friends. A recent trend is sharing physical possessions with the help of network technologies, initially rooms and apartments (e.g., Airbnb), but more recently also rides (Uber), cars (Getaround), and household items (Snapgoods). Current work on “sharing economy” services focuses mostly on motivations to participate [6, 15, 24]. Bakshy et al. [4] examined an interplay of social networks and social influence in adoption and transfer of user-generated content among friends and strangers in massively multiplayer virtual world. Sharing information about culinary/dietary preferences has grown in popularity, e.g. Davis et al. [10] investigated the design space for recipe sharing practices. Our study setting selects culinary and dietary practices as one of the emergent content types that people share.

As previous studies suggest, managing the audience to the shared content is one of the key factors in a service usage. Users perform *boundary regulation*, an act of optimizing the level of openness [2], to control who sees their content. Litt and Hargittai [28] investigated strategies for audience management on social networking sites, finding that social network users typically tried to enlarge the reach of their posts, rather than limiting it. Vihavainen et al. [38] describe the effect of automation in content sharing with respect to privacy perception. Their work suggests that while automated options requires less effort from the users, the downside is that the users may feel disempowered and unable to perform boundary regulation. In the era of asynchronous computer-mediated communication, users were able to express themselves in a carefully constructed manner [39, 40]. Currently users utilize various online services as communication channels to reach out heterogeneous audiences, which may lead to unexpected privacy problems. These strategies to reach composite audiences are described in the recent work by Sleeper et al. [36].

Context collapse concept is obfuscation of boundaries that allow individuals to keep different audiences separate in current online realm [9]. The *context collapse* of current online sharing makes it hard to for users to understand the actual audience, so the actions are performed to “imagined audiences” [27]. Boundary regulation in current online world has become hard due to the context collapse, and controlling the audience with different devices with their different capabilities needs consideration from the service designers. Our work addresses this problem by eliciting the current practices of using different devices.

Olson et al. [33] studied a person’s “willingness to share” for various intimate information items – from personal statistics to health related data – and indicated the importance of specifying correspondent privacy and access control preferences across different sharing groups. We adapted a similar methodology and asked our participants about their practices with respect to privacy settings for emergent shared content.

Despite the significant amount of research on device use and preferences over sharing different types of content, we are not aware on a comparative study that addresses content sharing practices with different devices. These insights would not only help framing future design and research explorations of mobile and desktop sharing practices, but ultimately improve overall user experience with a sharing service by building transparent and effective sharing interfaces.

3. STUDY DESIGN

We established six emergent domains of content sharing services using an initial literature review and a benchmarking survey involving 14 participants. They include: (1) music tastes; (2) travel

information; (3) sports; (4) physical possessions; (5) virtual possessions; and (6) food preferences. To arrive at these categories, we have looked at the existing work on sharing practices in CSCW and HCI scholarship, which traditionally focused on file sharing (e.g. in the form of documents) to facilitate group communication and collaborative work and media sharing (e.g. in the form of personal pictures and videos) to support and maintain social ties. The sharing categories we selected were not broadly covered in the research literature; however, they represent a wide scope of personal content that differs in several sharing dimensions, e.g., the medium to capture content (e.g. workout details are often captured using an app on smartphone or wearable device in contrast to virtual possessions in videogames, which are often created on desktop platforms) or the amount of disclosed details (e.g. on one hand personal travel plans, and on the other – often impersonal virtual artifacts in virtual social worlds). Furthermore, four categories of our inquiry – preferences of food, music, travel plans as well as details of physical exercises conform *communicative* logic of sharing in Web 2.0, while others – virtual possessions and details of shared apartments and cars manifest *distributive* act of sharing [18]. Finally, the emergent content categories differ in *mechanics* of sharing – some content items have to be manually selected in order to be shared (e.g. content related to travel plans or preferences of food), others can be continuously streamed online throughout a user activity (e.g. activity tracking from workouts apps or music tracks played with music steaming services like Spotify etc). The six selected categories encompass a wide range of shared content, however little yet is known about device selection and usage throughout practices of sharing emergent content. This study aims to fill this gap. We purposefully excluded popular content sharing platforms such as social networking sites (e.g., Facebook) or instant messaging services (e.g., WhatsApp), as these are already well-covered by prior research.

For each content sharing domain we created a set of questions to understand current device usage practices for accessing an emergent sharing service. In particular, we aim to identify reasons for device preference across different novel sharing service categories. We also wanted to determine whether mobile platforms afforded an easier and more efficient experience across different sharing domains in comparison to desktop counterparts. Following Olson et al.’s 2005 study [33] of preferences for sharing and privacy, we additionally asked participants how easy and efficient their experiences were with configuring privacy settings for a shared content item using a mobile and a desktop device. We only asked participants about sharing services they had actually used before. Finally, we wanted to understand whether the sharing service they used supported efficient and easy sharing on both desktop and mobile platforms. We distributed the survey URL through various social media channels, mailing lists, forums, researchers’ personal contacts, and by distributing printed flyers in five university campuses in two countries in Europe. We purposefully aimed for young adults since they are often more active and more involved in sharing personal experiences online [1] and generally have emerged as rapid adopters of digital technology [16]. The survey was accessible for the duration of three months. We raffled ten 40-Euro and one 100-Euro online shopping voucher among all participants who completed the survey.

3.1 Data Analysis and Methodology

We collected 200 responses from the online survey. 125 participants (63%) were male and 75 female (37%). Table 1 gives a detailed breakdown. 84% of participants had one or more academic degrees. Participants were dominantly male, with the

Table 1. Participant demographics

Demographics	Music Preferences	Travel Details	Physical Activity	Sharing Economy	Virtual Possessions	Culinary Habits
Average age	25.9	28.4	31.4	28.6	35.3	26.6
Males	47	22	22	11	14	9
Females	20	25	11	10	4	5
Total #	67	47	33	21	18	14

largest age group being 25-34 years. Occupations spanned a wide spectrum, including ICT jobs, researchers, educators, marketing professionals, and students. Participants were actively engaged in use of digital technologies, highly valued usefulness of technology in their lives and considered themselves skilled users of digital media and online communication tools.

For each participant, we collect basic demographic information as well as general information about their experience with emergent content sharing services. We asked participants to choose those content sharing categories they were most experienced with and specify the names of the corresponding services they were most familiar with. We collected their self-reported values of experience with each sharing service, as well as the frequency of access to the service using either a desktop/laptop computer, a smartphone, or a tablet device. In our analysis, we decided to combine smartphones and tablets into a single category since their user interfaces are often rather similar. Throughout the paper, we thus often combine tablet and smartphone users as mobile users. Additionally, we asked the respondents to explain why they use a particular device(s) to access a sharing service.

To identify common factors of device selection, we use the thematic analysis technique [7]. At first, three researchers on the team independently coded all open-ended answers using content analysis from grounded theory searching for emergent patterns [14]. In addition to counting instances of each factor, we also collected participants' quotes to support each factor of a given theme. The quotes were collected with targeted open-ended questions in the online survey. Our analysis followed an iterative process that repeatedly revisited the data, the researchers' notes, and the emerging structure of empirical categories (which we developed through recurrent reading of the material). Regular meetings were set to interpret the findings and discuss differences and overlaps of the identified content categories until we reach consensus for each aggregated dimensions. We invited researchers external to the project to several of these meetings in order to receive a critical review of our assumptions and the themes categorization. Finally, two researchers created affinity diagrams to reveal connection among themes and discussed device-related design and research opportunities in this emergent space. When it came to the quantitative analysis, we applied correlation analysis and non-parametric statistical tests to analyze the reported device usage practices and level of experience with a sharing service.

3.2 Measures

3.2.1 Level of Experience with a Service

We asked participants to self-assess their level of expertise with a sharing service and choose the most appropriate category: "Novice", "Advanced beginner", "Intermediate user", "Advanced user" "Expert user". We adapted Dreyfus' [13] 5-levels model of

skill acquisition to assess a participant's level of expertise with a service.

3.2.2 Device Usage to Access a Service

We asked participants to estimate their device usage to access a content sharing service on the scale from 0 ("Never used") to 10 ("Always use/used") for a desktop or laptop computer, a smartphone, and a tablet, respectively. Additionally, participants could indicate whether they use any other device with a sharing service and provide a correspondent score.

3.2.3 Usability Scores

We measured subjective efficiency and ease-of-use of a device, since perceived criteria are often relevant to the users' decision whether or not to use a service [11]. To measure perceived ease-of-use and efficiency of a device to access a particular sharing service, and to change correspondent privacy and access settings for a shared content item, we used 7-point Likert scales (e.g. "It is easy to change privacy settings for a shared item in this service using this device" for ease-of-use, and "It is fast to change privacy settings for a shared item in this service using this device" – for efficiency, respectively). We asked participants to indicate their level of agreement for both mobile and desktop devices. Each participant in our sample reported prior experience with at least one of the two platforms to access a content sharing service. Therefore we asked these questions about their actual experience.

4. RESULTS

We first report general findings about each content sharing category and device usage practices to access them, followed by a section with qualitative analysis of an empirical data where we identify device selection criteria across the categories. We then statistically determine whether mobile and desktop platforms significantly differ in relation to ease-of-use and efficiency in supporting sharing tasks.

4.1 Sharing Services and Reported Experience

Participants indicated a variety of specific apps and services they use to access the six different sharing domains. Note that these figures do not represent the general popularity of a service but rather describe our participants' preferences. We report the number of participants who have experience with a particular service in brackets (we asked participants to pick the one service in which they have the most experience).

- To share *music preferences* they used frequently music streaming services, most often Spotify (23 participants) and YouTube (20). Some participants shared music preferences through Last.fm (8), Soundcloud (6), Deezer (1), and Shazam (1).
- To share *trip details and travel plans*, channels span from dedicated travel apps like Trip Advisor (18 participants) or TripIt (2), to online social networks (13) and blogs (1), to Google Maps (9) and E-Mail (1).
- To share information about their *physical exercises* (i.e., workouts), our participants used Sportstracker (9 participants), Endomondo (5), Runtastic (2) and Strava (2), and other services (15 participants).
- Our "*sharing economy*" questions primarily asked about accommodation offerings and car sharing listings. Airbnb (6) and couchsurfing.com (7) were among the most mentioned services for sharing accommodation information. For car sharing services, most used BlaBlaCar (3) and Uber (1).

- To share *virtual possessions and objects* in videogames participants reported the use of many online communities and games, most often Second Life (5), Steam (4), and Minecraft (2).

- Foodspotting (3) and GialloZafferano (4) was the most frequently used service for food information sharing. Alternatively, participants preferred to share information about personal *food and culinary preferences* via social networking platforms (9).

Figure 1 describes the participants' level of expertise in the reported services. The majority of participants within each category rated themselves as "advanced" or "expert" users. In the physical activity, travel details, and sharing economy categories, over 25% of participants rated themselves as "intermediates".

We have conducted a quantitative analysis on our sample size to find whether participants reported equal experience levels across all sharing types categories. A Kolmogorov-Smirnov test of normality did not confirm the assumption of normality for the independent variable "sharing category type". Non-parametric Levene's tests did not confirm the homogeneity of variance assumption among sharing categories ($p = .003$). Moods median tests were performed with the reported "level of experience" – in a scale from 1 ("Novice") to 5 ("Expert") – as dependent variable and "sharing type" as independent variable. However, the analysis displayed no significant results ($\chi^2(6) = 11.853, p = .065$). This indicates that there were no significant differences across all categories for the reported experience level. In other words, participants reported similar levels of experience for all sharing categories independently, hence we can include all of them in the statistical analysis in the upcoming sections. This suggests that our observed population sample is representative in regard of experience with sharing services.

4.2 Device Usage Practices

Figure 2 describes the self-reported frequencies (mean values) of device usage for each sharing category. We can observe that services that support sharing physical activities are being primarily accessed using smartphones. Services that enable sharing travel plans and culinary preferences were equally used on desktop and smartphones, with a slight bias towards desktop for the former, and to smartphones for the latter. Sharing economy services and services for sharing music preferences were more often accessed using desktop interfaces than using a smartphone, and only rarely through a tablet. Nevertheless, combined *mobile* (smartphone and

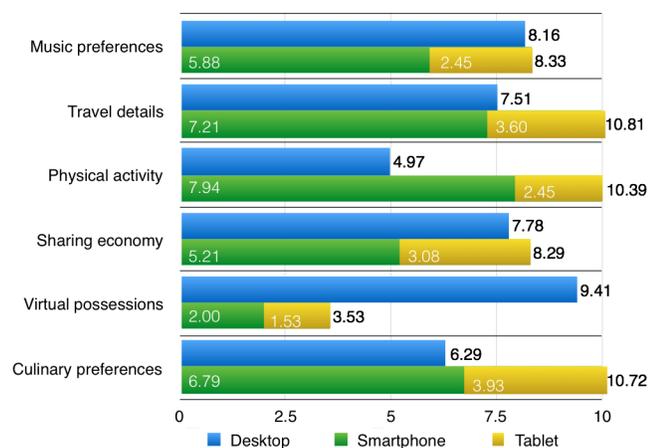


Figure 2. Reported device usage for each sharing category on the scale from 0 ("Never used") to 10 ("Always use/used").

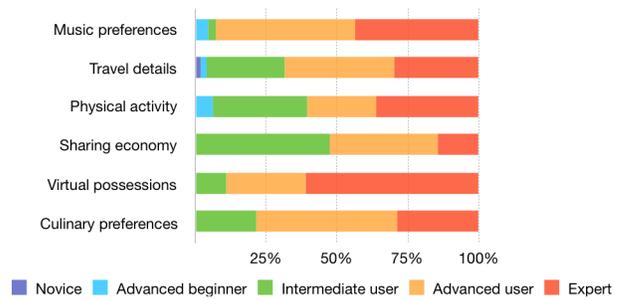


Figure 1. Participant's levels of expertise with a given service.

tablet) usage exceeds *desktop* usage in all sharing categories, except sharing virtual possessions (see Figure 2). Videogames and virtual social worlds services suggest that sharing is done primarily using desktop platforms, which offer more gaming performance.

In addition to smartphones, several participants who share information about their physical exercises reported the use of a complementary sport gear such as smart watches and heart-beat monitors to collect, and, subsequently, share personal experience. A number of participants used smart TVs and game consoles (i.e. Playstation) to share their music preferences. However, the reported usage was marginal; we therefore excluded them from our analysis.

4.3 Device Selection Criteria

To identify device selection criteria, we conducted a thematic analysis (for more detailed discussion on how analysis was performed see subsection 3.1 "Data Analysis and Methodology"). Two main themes emerged: *properties of a device* to access a sharing service and *user experience* with a sharing service itself.

Considering the properties of a device to access a service, three larger categories emerged: (1) enabling hardware; (2) primary device for a service, and (3) availability and portability of a device used for sharing.

4.3.1 Enabling Hardware

Firstly, participants indicated the importance of having significant screen real estate and a full-sized keyboard that is present in every desktop setup. This was particularly emphasized by participants who shared travel details and music preferences: "Because it is easier to put photos from the camera on the laptop and have a bigger display (than with a smartphone) to write about your experiences" (Female, 26, sharing travel plans and details). Our participants also preferred a desktop due to the lack of "battery drainage" problems, which often exists for mobile devices. Finally, participants indicated hardware advancement as an influential factor to choose a sharing platform. Desktop or laptop computers often provide enough storage space for personal content, or simply have more computational power to run software: "It has better capability with the graphics than a portable device" (Female, 57, sharing virtual possessions in a virtual world). On the other hand, smartphones were attractive sharing platform for reporting physical exercises. Mobile devices are equipped with many sensors that support capturing various psychological parameters, e.g., to share workouts.

4.3.2 Key Device for a Service

Some participants told us that they possess a single device to access the Internet; therefore, this sole device was their gateway to all

sharing services. For others, desktop and mobile devices were used out of habit. As long as a device serves the sharing purpose, participants did not see a need for an alternative platform: “I make updates mostly on my phone, and I also check new stuff usually while waiting [for] a bus or a train” (Male, 28, sharing culinary preferences). Participants who possess several devices often chose a primary device for a sharing task: “Because I need to write messages, check profiles, etc. It is something that I do carefully, with attention. I don't do it on the fly with my smartphone” (Female, 29, sharing accommodation listing). Some sharing services, such as activity tracking apps, are designed to be used using a wearable or a mobile device: “The phone is always with [me] and it is the key device to use and [get] data from application.” (Male, 24, sharing physical exercise data).

4.3.3 Availability and Portability

Often, at the time of a sharing task, users chose any device available at hand: “Because I have my phone turned on with me most of the time so gathering and sharing information is fast.” (Female, 28, sharing travel plans and details). For example, when sharing is not a primary activity (e.g., while gaming, or using a desktop device for work), participants mentioned the importance of multitasking, conveniently attainable using a desktop interface: “It allows me multitasking, as I like to have music in a background while doing other things on the computer.” (Female, 24, sharing music preferences). Smartphones in turn attract sharers on-the-go because of their portability: “I carry my phone during the activity. I share the activity as soon as I am available using my phone.” (Female, 25, sharing physical exercise data). However, when one would like to create a personal story with rich descriptive details about one's experience, portability is not of immediate importance. “I like to take my time for logging the exercises so I always do it when arrive home. And I prefer working with my computer, to make logs as descriptive as possible.” (Male, 24, sharing physical exercise data).

With respect to the user experience with a sharing service participants mentioned (1) importance of efficiency and ease-of-use of the sharing service, as well as (2) features that service affords and restrictions imposed by a service as key factors.

4.3.4 User Experience with a Service

Ease of use in the form of a dedicated app or a platform-optimized user interface influenced the choice of device: “The service is optimized for that [mobile] device” (Female, 17, sharing music preferences). Immediate and fast capturing and sharing capabilities make a mobile platform the obvious choice to share novel content: “My phone is always with me and always on so, it's easy and fast to do so with it.” (Female, 28, sharing travel plans and details). Surprisingly, on several occasions, users found a desktop interface simpler to use in order to share personal content: “Because the

interface to share [on desktop] is simpler, and, actually, I don't use the others devices at all to share stuff in general.” (Male, 27, sharing music preferences).

4.3.5 Service Features and Limitations

Rich service features, such as connectivity with a supporting device or social outreach, also often influenced the choice of device: “[T]here is an application for it and you can connect it with Facebook to see friends' activities”. (Female, 26, sharing music preferences). Several participants reported that artificial software restrictions on one platform made them switch to another one that better supports the sharing activity: “I use my laptop more than my smartphone because there are more restriction regarding the free use of [the service] with a smartphone” (Male, 24, sharing music preferences).

Some of the aforementioned criteria for device selection were represented better in one sharing domain than another. Figure 3 describes how factors that influence a choice of selecting a desktop (D) or a mobile platform (M) on a per-sharing category basis. Each inner cell in a table gives the number of findings encountered during the analysis of the open-coded answers regarding device selection practices. We color-coded cells in darker shades for higher hit counts – in blue for desktop platform and in green for mobile. We performed a two-way contingency table analysis to test the dependency of these device selection factors across different sharing categories for both mobile and desktop platforms. We found that there is a significant association – Pearson for mobile ($\chi^2(20) = 43.882, N = 116, p < .05, V = .308$) and desktop ($\chi^2(20) = 63.692, N = 132, p < .001, V = .347$). This means that device selection factors vary significantly across six sharing categories.

We now discuss each of the device selection factors listed in Figure 3, in descending order of total findings. *User experience with a service* is the most represented category of factors that influence a choice of a sharing device (85 findings). Our participants reported that mobile platforms provide adequate support for services that enable sharing workouts, travel plans, and culinary preferences. We speculate that this is due to the immediate capturing and sharing capabilities that a mobile platform affords. For music preferences and sharing economy services, user experience with a desktop interface seems to be more suitable. *Availability and portability* are the second most represented group of factors that influence device selection across all emergent content sharing categories (80 findings). These factors are predominantly available in mobile platforms for services that support sharing travel plans and physical exercises. Availability factors play important role for desktop environments, when sharing is not primary activity (e.g. playing videogames). For the remaining services (music preferences, culinary preferences, sharing economy) mobile and desktop devices are more or less equally balanced. The *enabling hardware* group of factors (33 findings) are important for services supporting the sharing of travel information and music preferences, as well as for sharing economy services and videogames. We find many instances of desktop interfaces in this group, where many tasks require bigger screen estate, a full-size keyboard, and/or advanced capabilities to store and share content. The *key device for a service* (27 findings) illustrates how mobile devices (smartphones) are a key enabler for sharing workouts, due to their portability and sensing capabilities. For travel plans, the picture is less clear: some users prefer the mobile device due to its in-situ sharing capabilities, while others rely on the ability of a desktop system to support in-depth reporting. Finally, *software features and limitations* (23 findings) are especially important when it comes to

	Music preferences		Travel plans		Physical exercises		Sharing economy		Virtual possessions		Culinary preferences		
	D	M	D	M	D	M	D	M	D	M	D	M	
Enabling hardware	5	1	8	1	3	6	4		5				33
Key device for a service	6	2	8	4		5					1		27
Availability and Portability	23	21	1	7	13	2	1	7				3	80
User experience with a service	14	8	14	21	2	4	10	6			1		85
Service features and limitations	4	2	1	1	2	4	1		7				23

Figure 3. Device selection factors that across different types of content sharing categories.

sharing virtual possessions, as most mobile systems simply are not able to run resource intensive virtual environments or games.

Next, we evaluated the association of extracted factors across our six sharing categories with respect to device preference. First, we calculated Pearson chi-square tests for factors that influence a device preference, to assess whether there is a significant association between device choice with the factors. The analysis showed a significant association between factors and device selection ($\chi^2(4) = 11.925$, $N = 248$, $p < .05$, $V = .219$). In other words, this indicates that the device selection factors extracted from qualitative data play a significant role in deciding on a device to access a sharing service. We then conducted a two-way contingency table analysis to test the dependency between device selection and sharing categories. Pearson chi-square tests revealed a significant association between device usage and sharing categories ($\chi^2(5) = 41.685$, $N = 248$, $p < .001$, $V = .41$). This finding is in line with our prior findings that certain sharing categories are preferred to be shared with certain devices (see Figure 2); for example, services that support sharing workouts are often accessed through smartphones.

4.4 Ease-of-use and Efficiency of Device Usage

Next, we wanted to statistically determine whether personal mobile devices provide more satisfactory and efficient user experience in supporting sharing tasks than their desktop counterparts. We asked our participants to report the experienced ease and speed to share content in a given service on both a mobile and a desktop platform. Additionally, following Olson et al.'s study [33] we inquired how easily or efficiently the task of changing privacy settings for a shared content item could be performed on a respective platform. Finally, we hypothesize that experience with a sharing service influenced efficiency and ease of sharing, as well as the ability to change privacy settings. In the following analysis, the scale ranges from 1 (very hard/slow) to 7 (very easy/fast).

We investigate with which device it is easier to share content based on participants' responses. We present our findings for all sharing categories in overall. A Wilcoxon signed-rank test showed that it is significantly easier for participants to share content using desktop platform than it is using mobile ($Z = -5.703$, $p < .001$). Furthermore, the median ease of sharing score with mobile platforms is 5 and with desktop platforms is 6.

Then we investigated with which device it is faster to share content based on participants' responses. A Wilcoxon signed-rank test showed that it is significantly faster for participants to share content using desktop environments than it is using mobile one ($Z = -4.908$, $p < .001$). In addition, median speed of sharing score with mobile devices is 5 and with desktop computers/laptops is 6.

For investigating with which device it is easier to change privacy settings for a shared content item, we again performed a Wilcoxon signed-rank test, which showed that it is significantly easier for participants to change the privacy and access settings using desktop devices than it is with mobile ($Z = -6.663$, $p < .001$). The median score of ease for changing privacy settings with mobile platforms is 4, while for desktop platforms it is 6.

For investigating with which device it is faster to change privacy settings, we performed another Wilcoxon signed-rank test, which showed that it is significantly faster for participants to change their privacy settings using desktop interfaces than it is using mobile ($Z = -7.11$, $p < .001$). The median score of speed for changing privacy

settings with a mobile device was 4, while for a desktop device it was 6.

All aforementioned findings suggest that, in general, participants found it easier and faster to share and, subsequently, to change privacy and access settings for a shared content item by using a desktop platform across all six emergent content sharing categories. Despite the fact that the services that afford sharing physical exercise and culinary preferences indicated more frequent usage on mobile devices, we found no significant difference in reported efficiency and easiness to share than using desktop platforms within those categories.

Finally, we investigated how one's reported level of experience with a sharing service affects one's self-reported measures of ease and speed of sharing as well as one's self-reported measures of ease and speed of change privacy settings for that particular type of shared content. We computed Spearman correlation coefficients for assessing the relationship between the overall reported level of experience with the ease and speed of sharing with desktop devices and mobile, as well as ease and speed of changing privacy settings with desktop platforms and mobile. We found a significant positive correlation between "reported experience level with sharing type" and "ease to share content on desktop" ($r_s = .186$, $p < .05$, $N = 141$) and with "speed of sharing on desktop" ($r_s = .213$, $p < .05$, $N = 166$). No other significant correlations were found between "reported experience level with a sharing type" and "ease of sharing with mobile" ($r_s = -.055$, $p = .477$, $N = 170$), or with "speed of sharing with mobile" ($r_s = -.038$, $p = .619$, $N = 173$). This indicates that the more experienced a participant is with a service, the easier and faster it is for him/her to share in desktop environments. From a privacy perspective, we found no significant correlations. In particular, we found no significant correlation between "reported experience level with a sharing service" and "ease of change of privacy settings" on desktops ($r_s = .119$, $p = .162$, $N = 140$) or for mobile ($r_s = -.008$, $p = .917$, $N = 166$), and no correlation between "reported experience level with a sharing service" and "speed of change of privacy settings" for desktops ($r_s = .08$, $p = .354$, $N = 138$) or for mobile ($r_s = -.013$, $p = .354$, $N = 138$). This indicates that an increased experience with a sharing service does not necessarily imply increased ease and speed in changing privacy settings for a shared content through this service.

5. DISCUSSION

Our results indicate that the desktop platform is often the preferred way to access emergent sharing services. However, collectively, smartphone and tablet usage has typically exceeded desktop usage and actively drives the mobile shift in digital content sharing. Nevertheless, despite the significant attention of designers and HCI practitioners for *mobile first* design [42], our participants still preferred desktop environments as being more efficient and easy to use for sharing emergent content online. This is particularly relevant when it comes to configuring privacy and access control settings for shared content items including both "audience limiting" and "audience reaching" [27, 28]. We believe that beyond the obvious advantages that mobile platforms afford, such as context of use and portability, mobile designers should focus on improving user experience with a sharing service, especially for managing privacy settings, in the sense of both limiting and reaching the desired audience. We suggest that mobile design should maintain a fair balance between ease to configure those settings and convenience to share (e.g. instant sharing) to the targeted audience, as well as allow a capacity to limit the audience upon user's request. Moreover, facilitating multi-channel sharing through a mobile platform may also improve the access control across online services

[36]. Additionally, our participants emphasized that they preferred to have mobile access to all features offered by desktop counterparts. Our findings suggest that even the services that enable automatic sharing and that are most frequently used with mobile devices do not properly support users in their efforts of controlling the audience of the shared content and managing privacy.

We identified five factors that influence device selection for novel content sharing services: (1) *Enabling Hardware*, (2) *Key Device for a Service*, (3) *Availability and Portability*, (4) *User Experience with a Service*, and (5) *Service Features and Limitations*. The criteria we identified are not guidelines for design. They are best seen as broad observations for researchers who explore the future design of emergent content sharing services. Some of those factors consolidate earlier research findings on, e.g., device usage at home [20, 22]. Our findings can be directly mapped onto these previously identified (hardware) factors. However, our study does not limit context of use only to home environments. We described device usage for emergent content sharing phenomena that prior scholarship did not investigate. In contrast to Kawsar's and Brush's [22] device preference factors (screen size, portability, interaction available, always on, and usability), our device selection criteria for content sharing services are empirically-driven: we extracted our factors using an open-coding technique of thematic and content analysis from grounded theory. Also, we measured self-reported efficiency and ease-of-use, and discovered that for emergent content sharing activities our participants found desktop platforms to be more adequate across all six emergent content sharing domains, in particular given that some services (e.g. physical exercise and food sharing) are more frequently used to capture content using mobile medium.

Based on the five device preference factors to access a content sharing service, we discovered that participants select which devices to use based on how well the affordances and the features of those sharing services and devices map to the sharing situation at hand and overall user's sharing goals. For example, services that afford sharing physical exercises were predominantly used on mobile devices, due to the effortless sensing and data collecting capabilities, as well as live-streaming opportunities. However, those who wanted to provide rich descriptive details of their workouts still preferred a desktop environment. Participants also reported the importance of interplay of devices when different features were needed. Jokela et al. [19] identified a similar practice and discussed the cost of using the same device versus changing device to the one with better capabilities while completing the task.

Moreover, we observed that, for desktop platforms, the experience with a content sharing service translated into efficiency and ease-to-share, but had no effect for privacy and access control settings of a shared content item. No correlations were found for mobile usage of such services. Bao et al. [5] presented similar findings. They concluded that a desktop platform was more favored because of its richer input capabilities. Kawsar and Brush [22] and Tossel et al. [37] stated that even though smartphones were used more due to the fast access they provide, a desktop system was still more preferable in occasions where more functionality was needed. Finally, Kawsar and Brush [22] found that smartphones and tablets had replaced established computing platforms for a wide range of activities at home. Our study observed similar usage trends for sharing emergent content online. Smartphone usage is dominant when sharing data about physical exercises and culinary preferences. Nevertheless, desktop platforms are still preferred for sharing virtual possessions, travel details, music preferences and sharing economy services.

5.1 Methodological Considerations

While online surveys often bias towards highly educated populations (84% of our participants had one or more academic degrees), this choice of method allowed us to reach a very international set of participants: our survey received replies from 15 countries across four continents. While our findings cannot easily be generalized (most of our participants were under 35 years of age and male), nonetheless we believe that we were able to reach the right target group for novel content sharing services (i.e. university students, ICT professionals), since young and middle age, high level of education, and past experience of using similar technologies are some of the basic characteristics of early adopters of technology in general [12, 16]. Moreover, the study addresses a significant population of sharers and that our account of these new phenomena can still help researchers and practitioners reflect on current practices with respect to existing sharing conventions, especially regarding device selection.

Since we had significantly smaller number of participants that share for the purpose of *distribution* (i.e. virtual possessions and personal physical possessions such as apartments and vehicles) rather than as an act of *communication* (e.g. workouts, travel details, food and music preferences), we refrain from making broad reflections how these two logics affect device usage practices. Future research might address this opportunity and evaluate how these differentiating attribute of sharing can help researchers and designers to create novel sharing services and deliver user experience tailored for a specific sharing act.

6. CONCLUSIONS AND FUTURE WORK

The core goal of our paper is to help frame future design explorations of mobile and desktop sharing interfaces. Our analysis of the survey responses suggests that, despite contemporary *mobile first* design efforts, desktop interfaces of emergent content sharing services are still considered more efficient and easier to use when it comes to both sharing and privacy/access control tasks. Our work also helps to improve our understanding of device usage within six emergent sharing service categories. We have empirically drawn up a set of factors that influence device preferences when accessing those sharing services. We identified that *enabling hardware*, *designated device for a service*, *availability and portability*, along with *ease-of-use and efficient experience* with a shared service, and a *service's features and imposed limitations* are important factors that users consider when selecting a device to access such sharing services.

In a next step, we plan to conduct further studies within individual sharing domains to uncover, at the user interface level, what sharing control elements are available on desktop and mobile devices to support sharing activities. This would help us to formulate a set of specific design recommendations for mobile platforms to reach appropriate level of ease-of-use and efficiency to access emergent content sharing services and additionally ease multi-channel sharing to reach heterogeneous audiences. Also, this would allow us, e.g., to investigate how those sharing interfaces can be accommodated on popular wearables devices, which increasingly used in emergent sharing activities (e.g. sharing workouts). To further our understanding of device usage for accessing emergent content sharing services, we plan to record and analyze actual (logged) usage across the six identified emergent sharing service categories. Additionally, we see value in conducting expert evaluations of selected services to understand how interaction design supports mobile sharing. Finally, we plan to conduct contextual observations and interviews to better understand the

reasons behind device selection and how the sharing tasks in general intertwine with the activities that the shared content is related to.

7. ACKNOWLEDGMENTS

This work was supported by Swiss National Science Foundation grant 156406 “SHARING21 - Future Digital Sharing Interfaces”.

8. REFERENCES

- [1] Acquisti, A., Gross, R. 2006. Imagined communities: awareness, information sharing, and privacy on the Facebook. In *Proceedings of the 6th international conference on Privacy Enhancing Technologies (PET'06)*, 36-58. http://dx.doi.org/10.1007/11957454_3
- [2] Altman, I. 1975. *The environment and social behavior*. Monterey, CA: Brooks/Cole.
- [3] Aizenbud-Reshef, N., Barger, A., Guy, I., Dubinsky, Y., Kremer-Davidson, S. 2012. Bon voyage: social travel planning in the enterprise. In *Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work (CSCW '12)*, 819-828. <http://doi.acm.org/10.1145/2145204.2145326>
- [4] Bakshy, E., Karrer, B., Lada A. A. 2009. Social influence and the diffusion of user-created content. In *Proceedings of the 10th ACM conference on Electronic commerce (EC '09)*, 325-334. <http://doi.acm.org/10.1145/1566374.1566421>
- [5] Bao, P., Pierce, J., Whittaker, S., Zhai, S. 2011. Smart phone use by non-mobile business users. In *Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services (MobileHCI '11)*. ACM, New York, NY, USA, 445-454. <http://dx.doi.org/10.1145/2037373.2037440>
- [6] Bellotti, V., Ambard, A., Turner, D., Gossman, C., Demkova, K., Carroll, J.M. 2015. A Muddle of Models of Motivation for Using Peer-to-Peer Economy Systems. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15)*, 1085-1094. <http://doi.acm.org/10.1145/2702123.2702272>
- [7] Berg, B. L., Lune, H. 2014. *Qualitative research methods for the social sciences*. Pearson.
- [8] Böhmer, M., Hecht, B., Schöning, J., Krüger, A., Bauer, G. 2011. Falling asleep with Angry Birds, Facebook and Kindle: a large scale study on mobile application usage. In *Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services (MobileHCI '11)*. ACM, New York, NY, USA, 47-56. <http://dx.doi.org/10.1145/2037373.2037383>
- [9] boyd, D. 2008. *Taken out of context: American teen sociality in networked publics*. Doctoral dissertation, University of California, Berkeley.
- [10] Davis, H., Nansen, B., Vetere, F., Robertson, T., Brereton, M., Durick, J., Vaisutis, K. 2014. Homemade cookbooks: a recipe for sharing. In *Proceedings of the 2014 conference on Designing interactive systems (DIS '14)*, 73-82. <http://doi.acm.org/10.1145/2598510.2598590>
- [11] Davis, F.D. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly* 13, 3 (1989), 319.
- [12] Dickerson, M.D. and Gentry, J.W., 1983. Characteristics of adopters and non-adopters of home computers. *Journal of Consumer research*, 10, 2 (1983), 225-235.
- [13] Dreyfus, S.E., Dreyfus, H.L. 1980. *A five-stage model of the mental activities involved in directed skill acquisition*. Report No. ORC-80-2. University of California, Berkeley.
- [14] Glaser, B. G. Strauss, A.L. 2009. *The discovery of grounded theory: Strategies for qualitative research*. Transaction Publishers.
- [15] Ikkala, T., Lampinen, A. 2015. Monetizing Network Hospitality: Hospitality and Sociability in the Context of Airbnb. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW '15)*, 1033-1044. <http://doi.acm.org/10.1145/2675133.2675274>
- [16] Ito, M., Baumer, S., Bittanti, M., Cody, R., Stephenson, B.H., Horst, H.A., Lange, P.G., Mahendran, D., Martínez, K.Z., Pascoe, C.J. and Perkel, D., 2009. *Hanging out, messing around, and geeking out: Kids living and learning with new media*. MIT press.
- [17] John, N.A. 2012. Sharing and Web 2.0: The emergence of a keyword. *New Media & Society* 15, 2 (2012), 167-182
- [18] John, N.A. 2013. The Social Logics of Sharing. *The Communication Review* 16, 3 (2013), 113-131.
- [19] Jokela, T., Ojala, J., Olsson, T. 2015. A Diary Study on Combining Multiple Information Devices in Everyday Activities and Tasks. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15)*. ACM, New York, NY, USA, 3903-3912. <http://dx.doi.org/10.1145/2702123.2702211>
- [20] Karlson, A.K., Meyers, B.R., Jacobs, A., Johns, P., Kane, S.K. 2009. Working Overtime: Patterns of Smartphone and PC Usage in the Day of an Information Worker. In *Proceedings of the 7th International Conference on Pervasive Computing (Pervasive '09)*, Hideyuki Tokuda, Michael Beigl, Adrian Friday, A. J. Brush, and Yoshito Tobe (Eds.). Springer-Verlag, Berlin, Heidelberg, 398-405. http://dx.doi.org/10.1007/978-3-642-01516-8_27
- [21] Kane, S.K., Karlson, A.K., Meyers, B.R., Johns, P., Jacobs, A., Smith, G. 2009. Exploring Cross-Device Web Use on PCs and Mobile Devices. In *Proceedings of the 12th IFIP TC 13 International Conference on Human-Computer Interaction: Part I (INTERACT '09)*, Springer-Verlag, Berlin, Heidelberg, 722-735. http://dx.doi.org/10.1007/978-3-642-03655-2_79
- [22] Kawsar, F., Brush, A.J.B. 2013. Home computing unplugged: why, where and when people use different connected devices at home. In *Proceedings of the 2013 ACM international joint conference on Pervasive and ubiquitous computing (UbiComp '13)*. ACM, New York, NY, USA, 627-636. <http://dx.doi.org/10.1145/2493432.2493494>
- [23] Kirk, D., Sellen, A., Rother, C., Wood, K. 2006. Understanding photowork. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '06)*, ACM, New York, NY, USA, 761-770. <http://dx.doi.org/10.1145/1124772.1124885>
- [24] Lampinen, A.M.I. 2014. Account sharing in the context of networked hospitality exchange. In *Proceedings of the 17th ACM conference on Computer supported cooperative work*

- & social computing (CSCW '14), 499-504.
<http://doi.acm.org/10.1145/2531602.2531665>
- [25] Lella, A., Lipsman, A. 2015. 2015 U.S. Digital Future in Focus. Retrieved February 10, 2016 from
<https://www.comscore.com/Insights/Presentations-and-Whitepapers/2015/2015-US-Digital-Future-in-Focus>
- [26] Lehmuskallio, A., Sarvas, R. 2008. Snapshot video: everyday photographers taking short video-clips. In *Proceedings of the 5th Nordic conference on Human-computer interaction: building bridges* (NordCHI '08). ACM, New York, NY, USA, 257-265. <http://dx.doi.org/10.1145/1463160.1463188>
- [27] Litt, E., & Hargittai, E. 2016. The Imagined Audience on Social Network Sites. *Social Media+ Society*, 2(1), 2056305116633482.
- [28] Litt, E., & Hargittai, E. 2016, February. "Just Cast the Net, and Hopefully the Right Fish Swim into It": Audience Management on Social Network Sites. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (CSCW'16). ACM, New York, NY, USA, 1486-1498
- [29] Miller, A.D. Edwards, W.K. 2007. Give and take: a study of consumer photo-sharing culture and practice. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '07). ACM, New York, NY, USA, 347-356. <http://dx.doi.org/10.1145/1240624.1240682>
- [30] Munson, S.A. Consolvo, S. 2012. Exploring goal-setting, rewards, self-monitoring, and sharing to motivate physical activity. In *Proceedings of 6th International Conference on Pervasive Computing Technologies for Healthcare* (PervasiveHealth'12), 25-32.
- [31] Müller, H., Gove, J. Webb, J. 2012. Understanding tablet use: a multi-method exploration. In *Proceedings of the 14th international conference on Human-computer interaction with mobile devices and services* (MobileHCI '12). ACM, New York, NY, USA, 1-10. <http://dx.doi.org/10.1145/2371574.2371576>
- [32] Mueller, F., Vetere, F., Gibbs, M.R., Edge, D., Agamanolis, S., Sheridan, J.G. 2010. Jogging over a distance between Europe and Australia. In *Proceedings of the 23rd annual ACM symposium on User interface software and technology* (UIST '10), 189-198. <http://doi.acm.org/10.1145/1866029.1866062>
- [33] Olson, J.S. Grudin, J., Horvitz, E. 2005. A study of preferences for sharing and privacy. In *CHI '05 Extended Abstracts on Human Factors in Computing Systems* (CHI EA '05). ACM, New York, NY, USA, 1985-1988. <http://dx.doi.org/10.1145/1056808.1057073>
- [34] Prasad, A., Sorber, J., Stablein, T., Anthony, D., Kotz, D. 2012. Understanding sharing preferences and behavior for mHealth devices. In *Proceedings of the 2012 ACM workshop on Privacy in the electronic society* (WPES '12), 117-128. <http://doi.acm.org/10.1145/2381966.2381983>
- [35] Santosa, S., Wigdor, D. 2013. A field study of multi-device workflows in distributed workspaces. In *Proceedings of the 2013 ACM international joint conference on Pervasive and ubiquitous computing* (UbiComp '13). ACM, New York, NY, USA, 63-72. <http://dx.doi.org/10.1145/2493432.2493476>
- [36] Sleeper, M., Melicher, W., Habib, H., Bauer, L., Cranor, L.F., Mazurek, M.L. 2016. Sharing Personal Content Online: Exploring Channel Choice and Multi-Channel Behaviors. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (CHI '16). ACM, New York, NY, USA, 101-112. DOI: <http://dx.doi.org/10.1145/2858036.2858170>
- [37] Tossell, C., Kortum, P., Rahmati, A., Shepard, C., Zhong, L. 2012. Characterizing web use on smartphones. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '12). ACM, New York, NY, USA, 2769-2778. <http://dx.doi.org/10.1145/2207676.2208676>
- [38] Vihavainen, S., Lampinen, A., Oulasvirta, A., Silfverberg, S., & Lehmuskallio, A. (2014). the clash between Privacy and automation in Social Media. *Pervasive Computing*, IEEE, 13(1), 56-63.
- [39] Vitak, J., Blasiola, S., Patil, S., Litt., E. 2015. Balancing audience and privacy tensions on social network sites: Strategies of highly engaged users." *International Journal of Communication* 9 (2015).
- [40] Vitak, J. 2012. The impact of context collapse and privacy on social network site disclosures. *Journal of Broadcasting & Electronic Media*, 56, 4 (2012). 451-470.
- [41] Volda, A., Grinter, R.E., Ducheneaut, N., Edwards, W. K., Newman, M.W. 2005. Listening in: practices surrounding iTunes music sharing. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (CHI '05), 191-200. <http://doi.acm.org/10.1145/1054972.1054999>
- [42] Wroblewski, L. 2012. *Mobile first*. Editions Eyrolles.