
Towards User-Centered Mashups: Exploring User Needs for Composite Web Services

Kaisa Väänänen-Vainio-Mattila
Tampere University of Technology,
Human-Centered Technology
Korkeakoulunkatu 6, 33720
Tampere, Finland
kaisa.vaananen-vainio-
mattila@tut.fi

Minna Wäljas
Tampere University of Technology,
Human-Centered Technology
Korkeakoulunkatu 6, 33720
Tampere, Finland
minna.waljas@tut.fi

Abstract

The Web contains a vast amount of services supporting users in various facets of life. In mashup or composite Web services, elements from various services are combined to create a service which suits users' needs. Our goal was to explore what kind of composite services users would need. We conducted semi-structured interviews with nine Web service users to investigate their experiences of service composition and expectations to future services. We also asked the participants to sketch their ideal composite service UI for both PC and mobile device. Our results indicate that service users do not yet have much experience of mashups but there is a need to merge functionality and data from different services to achieve the customized, integrated Web service. This work contributes to the development of future Web services and mashup tools.

Keywords

Web service, composite service, mashup, user needs.

ACM Classification Keywords

H.3.5 Online Information Services, H.5.2 User Interfaces.

General Terms

Design, Human Factors.

Copyright is held by the author/owner(s).

CHI 2011, May 7–12, 2011, Vancouver, BC, Canada.

ACM 978-1-4503-0268-5/11/05.

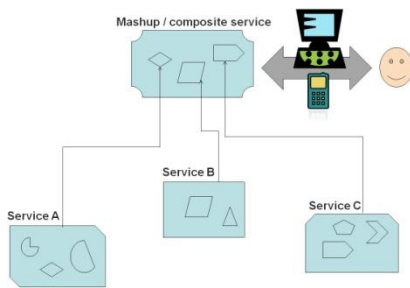


figure 1. The concept of a mashup or composite service: Service data and functionality come from different service sources.

Introduction

Internet has become a source of vast amount of services for social networking, media sharing, information acquisition, etc. Whereas in many cases the existing services support users' goals well, more customizable service solutions may also be needed. A recent phenomenon is to build *mashup* services.

Mashup has been defined as *"a combination of pre-existing, integrated units of technology, glued together to achieve new functionality, as opposed to creating that functionality from the scratch."* [3] Typical mashups include combinations of maps, media services, travel and shopping information, and news [10]. By a composite service we mean a service which combines elements from various sources (see Fig. 1). Mashups are one important type of composite services, but composites can also be less loosely integrated than actual mashups, e.g. embedding a link to a service within another, or defining a personalized service portal by combining services from various providers.

Mashup tools with open APIs have been developed for users with some level of programming skills (e.g. Yahoo! Pipes [9] or Microsoft Popfly [6]), but a majority of Web service users are not skilled or interested in such efforts. Our research aims to shed light to what kind of mashups or composite services users would need and how they would combine them from various service sources. This understanding will contribute to the user-centered mashup service development.

Related work

Besides programming by writing code, mashup-type customized service *dashboards* can be created with specific tools, for example iGoogle [4] and Netvibes [7]. Cao et al [1] conducted a study with ten Web users

who had no significant programming background. The participants created a mashup using Microsoft Popfly Mashup Creator, which was an online visual programming environment [6]. The participants encountered various problems when creating a mashup, mainly because the tool did not provide adequate support for successful decision-making.

Zang and Rosson [11] studied non-programmers working with Yahoo! Pipes mashup tool. The study concluded that this particular tool was not specifically designed for a complete novice user. However, even professional programmers faced problems when creating mashups. Instead of utilizing tools they may code what they need for their mashups. Hartmann et al [3] interviewed professional programmers and Web developers. A major concern for the professionals was getting data for mashups, as APIs were not available or they were designed for specific needs of those users.

One of the key contributors of good service user experience is the dynamic nature of services [8] which can be supported by composites. There seems to be very little prior research on end-users' needs to combine services. Cui et al [2] describe a laboratory study of LinkedUI concept and found out that users like to see their preferred services in one dynamic view on the mobile device. In this study, our goal was to find out *how* end-users would like to combine services.

Study process and the participants

To explore users' perceptions and experiences of service composites, we conducted a qualitative study with nine semi-structured interviews with the following themes: current service usage, composition of the services, and future service usage expectations. All

themes were discussed from both PC and mobile device points of view. The qualitative data was analyzed by thematic coding of participants' interview statements.

To gain more detailed understanding of user perceptions and ideas of service composites, the participants were also asked to sketch a composite service user interface (UI) that would combine service elements that are significant to them. The UI sketches were drawn for both PC and mobile device. In the analysis of the sketches we looked for similarities and distinct features of the UI styles and features.

The participants were employees and students of Tampere University of Technology. They all had versatile experience on using Web services, e.g. social media (e.g. Facebook), news services, and a map service (Google Maps). Further, they all had used some Web services with a mobile device. None of them were mashup hobbyists or professionals. There were 6 males and 3 females, between 26 and 44 yrs, average 32 yrs.

Results of the interviews

Current service usage

The most used services for the participants were Facebook (7 out of 9), Google Maps (6/9), various news services (5/9) and Google search (4/9). Spotify and Skype were also mentioned. PC was clearly the more used service access device, however the majority (78 %) of the participants' most used services were used also on the mobile. The most common benefits for using the services was that they were considered cheaper (or free), or more efficient or easier to use than other services or means for the same purpose.

The most often mentioned shortcoming of the used services was that relevant content was missing. For example, bicycle routes and orienteering maps were needed in Google Maps. In many cases, relevant functionality was also missing, e.g. mobile search functions or location-based transport information.

Participants perceived individual services having a specific focus or purpose. Some services may relate to the same domain, e.g. music or communication, but different things are done in each service. For example, last.fm is used for viewing music-related information while Spotify is used for listening to music. Most (7/9) saw that some of the services they use complement each other. For example, different news services provide alternative viewpoints to the same topic. IRC, Facebook and email are all meant for communication but they are at their best in different situations.

Many mentioned that they feel that services were somehow fragmented. About half (4/9) brought up a need for a centralized service for certain domains, e.g. discussion, movies or genealogy. 2/9 brought up a need for a service administration tool that would show all new content on one page, at a glance.

Service composition experiences

We asked if the participants had appended components (such as new applications or add-on features) to the services they use. 6/9 participants said they had created at least one such composite service. None of them had created (programmed) a new component themselves but utilized ready-made components. For example, the following composition actions were reported: installing a widget to N900 mobile device for showing updates from Facebook, installing Adblock to

Mozilla Firefox browser for removing online advertising, and unlocking new features to a game. These examples show that the participants considered words “service” and “add-on components” in various ways; a widget on a mobile UI, an extension to an Internet browser, and a game feature were all interpreted as add-ons.

Experiences with add-ons varied. All but one participant reported they had had some problems when installing add-on components. One user stated that “Adblock has made the service more like I want it” (male, 29). Another user had removed the add-ons he had installed since he felt that “Add-ons did not improve the usage experience enough to be useful” (male, 36).

We also enquired if the participants had connected services to each other in some way. 5/9 told that they had connected services. In all cases, Facebook was one of the services, the other service varied, e.g. Spotify, Xbox, Nokia Sports Tracker and a news service.

Future service expectations

We also asked what kind of Internet services the participants would like to have in the future. 6/9 brought up the need to integrate content and/or functionality from various services. Their ideas included a tool showing new content from the user’s central services, combining Spotify with last.fm, and an archive including all audio/video material produced in different services. The common idea was to have the relevant functionality and content related to one domain available in one service. “As many features as possible should be in the same service; now I have to use Skype for one thing and Facebook for others, and a third service for something else, because people are in different services.” (female, 34) Two users also brought up the need for a centralized login.

3/9 mentioned interactivity with other people through the service as an important quality of future services. For example, “Customer services should not tell you to ‘push one’ and ‘push two’ and so on but these services should work more like Skype chat.” (male, 36)

The participants’ expectations relating to mobile service usage were quite different to the above PC-related issues. No one mentioned service integration on the mobile but two thirds (6/9) highlighted the simplicity of mobile services. 3/9 brought up redesigning existing web services to better support mobile usage.

Sketches of ideal composite service UIs

In the sketching assignment the participants could present their ideas for their personal composite Web service of the future. The PC UI was drawn on a blank A3 paper (297 x 420 mm) and mobile UI on a 72 mm x 105 mm piece of blank paper.

PC UI for composite services

In most (6/9) drawings the PC UI consists of various box-like sections (an example in Figure 2). In some of these drawings each section includes content or functionality from a particular service, e.g. a specific email (e.g. Gmail), social media application (e.g. Facebook) or a weather forecast service. In addition, there are links to user’s favorite sites or services. In the rest of the box-like drawings a section includes composites, e.g. an email section with the latest emails from any of the user’s email accounts. Some participants stated that they want to see things at a glance. “[It is] not a weakness that there are many things on the large [PC] screen.” (male, 27)

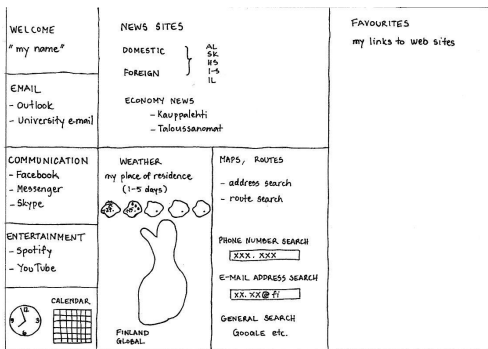


figure 2. A sketch of a participant’s ideal composite service UI on PC.

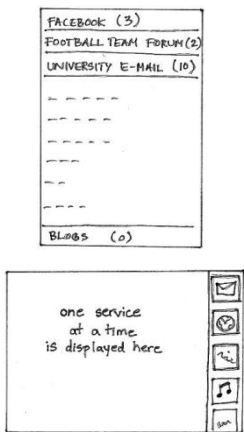


figure 3. Sketches of participants' ideal composite service UIs on the mobile device.

3 out of 9 of the PC UI drawings utilized tab structure. Two of these drawings were based around Facebook, and various other services relating to music and photos were appended. The third drawing utilizing tab structure had quite a different approach. The idea of the composite service was to nurture user's happiness. Each tab related to a different part of user's life such as "Friends and family", "Work", "Psychological trainer" or "Entertainment". "[the service] puts them [the things one has to do] in such a form that they enhance happiness." (male, 28) For example, "Work" tab included the services needed at work, such as email, dictionary and map. "Psychological trainer" gave the user advice on how to avoid stress and how to maintain happiness. It would also add advice on other tabs, e.g. "Friends and family" or "Work". This participant also emphasized the aesthetics of the service.

Most (7/9) sketches included at least one tool for social interaction, e.g. email, Facebook or an instant messaging tool. Other common things included in the drawings were a weather service and calendar. One third (3/9) of the drawings included more than one service for the same purpose. In all of these drawings there were more than one email account, in one there were two bank accounts, and in one there were two music services. The reason for including multiple services was the complementary nature of the services.

The need for customizing the service came up repeatedly. Many participants mentioned that they want to filter the content in their own service. One of the drawings was quite similar to an existing dashboard service Netvibes [7], but there were better filtering options in the participant's service.

Mobile UI for composite services

In general, the mobile UIs were considerably simpler than the PC UIs. A distinct, light mobile version of the composite service is needed. Even though an easy overview is an aim also on the mobile, participants stated that in the mobile UI, less information or functionality is shown at the same time. This may also mean utilizing less media (optimizing the downloading speed), deeper hierarchies for functionality (optimizing screen estate) or showing only new content.

Four mobile UI sketches included only simple links or buttons for services in the main view (see Fig 3, top). Another four UIs were like simplified version of the PC UI. In one mobile UI there was a narrow service navigation bar on the screen (Fig 3, bottom). In the bar there were small visual icons for important services.

Discussion and conclusions

People are often using Web services which are related to or partly redundant with each other. Some of these services lack adequate functionality and content. To compensate the shortcomings, users get missing things from another service. As a result, the usage of the services may become fragmented and discontinuous.

Our study participants expected that future services will bring information closer to them, even into one view. Less user actions than today should be needed to access information. This could be accomplished by integrating their customized functionality and content from separate services into composite service UIs. The services may either be from the same domain, such as music, or from separate areas of the user's life. One central point of integration is social networking, as it has become an essential service domain for many

users. We think that one of the participant's creative idea of a composite service aiming at nurturing user's happiness is worth developing further.

The participants' sketches of the ideal composite service UI resembled more portal-type UIs rather than very tightly integrated mashup services. This may be because it is difficult for the service end-users to envision how data streams from various sources can be combined. The mobile UI sketches were stripped-down UIs with customized shortcut lists and features for highlighting new service contents. These ideas echo the basic principles of mobile interaction design (e.g. [5]). Still, we believe that our findings shed light into users' needs for ways to combine services on these platforms.

Overall, the ideas presented in the sketches were in line with the interview findings. Thus the used methods complemented each other well, and the drawings concretized certain issues on a visual level. Still, we are aware of the limited power of interviews in exploring user needs of future technology. A further user study with mashup prototypes and a larger user sample would reveal more detailed user needs and ways of using such services.

It seems that creation of composite services or mashups by end users is not yet a well-known activity. This may be a consequence of the limited possibilities for merging services without programming skills or spending time learning how to use mashup tools. To this end, the future mashup tools could include templates and exemplars for domain-specific or cross-domain service functionality.

Composite services enable tailoring of service offerings to fit users' needs. Usable tools should be developed for creation of user-centered mashup services.

Acknowledgement

We thank Iiro Viitanen for conducting the user sessions.

Citations

- [1] Cao, J., Riche, Y., Wiedenbeck, S., Burnett, M., and Grigoreanu, V. End-User Mashup Programming: Through the Design Lens. *Proc. CHI'10*, ACM (2010), 1009-1018.
- [2] Cui, Y., Honkala, M., Pihkala, K., Kinnunen, K., Grassel, G. Linked internet UI: a mobile user interface optimized for social networking. *Proc. MobileHCI'10*, ACM (2010), 45-54.
- [3] Hartmann, B., Doorley, S., and Klemmer, S. R. Hacking, Mashing, Gluing: Understanding Opportunistic Design. *IEEE Pervasive Computing* 7, 3 (2008), 46-54.
- [4] iGoogle, <http://www.google.com/ig> (27.12.10)
- [5] Jones, M., Marsden, G. *Mobile Interaction Design*. Wiley, West Sussex, UK, 2006.
- [6] Microsoft Popfly (the service is discontinued), http://en.wikipedia.org/wiki/Microsoft_Popfly (27.12.10)
- [7] Netvibes, <http://www.netvibes.com/en> (27.12.10)
- [8] Väänänen-Vainio-Mattila, K., Väättäjä, H., Vainio, T. Opportunities and Challenges of Designing the Service User eXperience (SUX) in Web 2.0. In Saariluoma, P. and Isomäki, H. (Eds.), *Future Interaction Design II*, Springer, 2009, 117-140.
- [9] Yahoo! Pipes, <http://pipes.yahoo.com/> (27.12.10)
- [10] Zang, N., Rosson, M. B., and Nasser, V. Mashups: Who? What? Why? *CHI'08*, ACM (2008), 3171-3176.
- [11] Zang, N., and Rosson, M. B. Web-Active Users Working with Data. *Ext. Abstracts CHI'09*, ACM (2009), 4687-4692.