Teasing Apart and Piecing Together: Towards Understanding Web-based Interactions

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ABSTRACT
It is difficult to deeply understand web-based interactions and people's use of information online. This makes it difficult to capture existing web experiences so they can be recreated in other systems (for example, to help with accessibility) and to move real-world situations to the web while maintaining the essential elements of the original situation (for example, creating digital equivalents of existing social environments). We describe TAPT, a tool for achieving this understanding, and we present a comparative evaluation of TAPT against using Scenarios or Group Discussion to capture user experience. We discuss the results of this evaluation, which suggests that while Scenarios can help capture specific experiences from certain types of user, and Group Discussion requires less effort, TAPT is superior at teasing out in a structured way the key elements that make an experience what it is. Our results show that TAPT could be a valuable tool for analysing and redesigning online experiences, and that the best approach to design may be to apply multiple methods in a complementary fashion.

Keywords
web-based interactions, physical to digital, understanding, analysis, design

1. INTRODUCTION
Web Science is based on the notion that "understanding the Web involves not only an analysis of its architecture and applications, but also insight into the people, organizations, policies, and economics that are affected by and subsumed within it."[1] To this end we have developed TAPT (Teasing Apart, Piecing Together), a tool for understanding web-based interactions and modelling real-world interactions on the web.

The motivation for TAPT's development begins with social networking sites (SNS). These zones of social interaction can be a source of fun [9] and emotional support [27]. However, offline members of society are excluded from these facilities. This issue is increasingly important, especially given obstacles faced by the elderly in the uptake of technology [18], the trend for ageing populations, and the geographical dispersion faced by many families. Some members of offline groups (such as the elderly) can become vulnerable without regular social contact.

One approach to this issue is to afford broader access to social technologies by providing them in a more accessible fashion. One method is to re-provide online experiences in new contexts, for example via familiar technologies such as televisions, or cheap and accessible technologies such as digital photo frames.

Re-providing SNS functionality via pervasive technologies is a task which we can tackle technologically. However, it is far more difficult to re-provide the subjective, emotional benefits of SNS use: these are experiential, and difficult to pin down.

The goal of supporting such re-provision led the authors to develop TAPT, a method for understanding experiences and translating these into new contexts. TAPT is a formal, evaluated process based on Dix's idea of deconstruction [4] which itself was first discussed in the context of Web Science in 2009 [21].

In this paper, we discuss related work in Section 2 and describe TAPT in Section 3. Section 4 describes a 43-participant evaluation of TAPT. In Section 5 we present designs resulting from this experiment, while Sections 6 – 9 present questionnaire responses. Finally, we discuss those results in Section 10.

2. RELATED WORK
Much research has considered software design processes: for example, 25 years have passed since Gould and Lewis [8] discussed principles of system design, and 15 years since design patterns were first appropriated by computer scientists [6].

Design has been discussed in the context of specific domains including the home [13], eldercare [11], hypertext [19] and multi-modal, ubiquitous systems [22]. Topics include metaphors [16] and aspects such as aesthetics and narrative [20].

Although understanding user experiences is clearly invaluable, traditional methods do not always enable this. For example, tools such as scenarios and personas [3] focus on end users, but it is not always clear how they scaffold an understanding of user *experiences* grounded in specific contexts. Hart [9] considers the contrast in results of traditional heuristic evaluation and a study intended to elicit user experience. According to the traditional evaluation, Facebook is terribly designed (for example, it is not "aesthetic and minimalist"), and yet its success suggests that it is certainly not hard to use. Understanding the modern day web experience may help drive more holistic design guidelines.

The growing field of UX (User Experience) reflects an increased interest in user-focused approaches to software engineering [10]. UX is inherently subjective: Bardzell [1] emphasises the need for rigour, to 'transcend anything-goes subjectivism and offer systematic, evidence-based analyses of subjective phenomena'.

Forlizzi [5] discusses user-, product- and interaction-centered approaches to understanding UX, while Mahlke [17] considers hedonics and aesthetics alongside affect and emotion. Some have considered user-based evaluation [14], and understanding UX through prototyping [2].

We are particularly interested in issues of accessibility. Previous work has discussed user-centered design (UCD) in this context: Wiley [26] applied UCD in designing a message center for

[1] http://www.websci10.org/home.html

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elders living at home, while Keyani [15] applies the paradigm to design an augmented dancing environment for elders. More broadly, existing work examines multiple meanings in design [25] and approaches to 'reflective' design [24], including areas such as participatory [23] and ludic design [7].

In summary, UX has received increased interest in recent years, and yet one single model of UX does not exist, and there appears to be a dearth of interdisciplinary approaches to design.

3. TAPT: TEASING APART, PIECING TOGETHER

We have developed TAPT, an approach for designing systems inspired by an original experience in a particular context, and based around re-providing that experience in a new context. In this section we describe TAPT's history and the process itself.

3.1 Motivation for Formulating TAPT

TAPT was built to support the re-design of social technologies. It involves 'pulling apart' and abstracting an experience, then rebuilding the abstract experience in a new context.

TAPT is based on an approach called deconstruction, presented by Alan Dix [4]. Dix used deconstruction to provide web-based versions of Christmas crackers. A cracker is a tube wrapped in brightly coloured paper. When pulled by two people, it splits into two uneven parts. Crackers generally contain a paper hat, a small plastic toy and a motto or joke.

Dix wanted to create virtual crackers on a website. Rather than emulating real crackers, Dix captured aspects of the cracker experience and translated those to the web. He deconstructed 'pulling a cracker' and reconstructed it in the new medium. For example, one aspect of the experience is its shared nature. To incorporate this, the sender of a virtual cracker cannot see its contents until the recipient has 'pulled' it by clicking on a link.

The authors wanted to formalise deconstruction and make it more useful to software engineers. Our contribution is TAPT, a structured process that produces well-defined artefacts. TAPT is inspired by the idea of deconstruction and makes explicit the process of re-providing an experience.

3.2 The TAPT Process

TAPT comprises two parts. 'Teasing Apart' helps understand an experience by analysing it on various levels, including design and experiential aspects: to take the Christmas crackers example, one might consider cultural connotations and the unknown nature of each cracker's contents. 'Piecing Together' takes the output of 'Teasing Apart' to re-provide it in a new context: it involves brainstorming, building scenarios, and checking the reconstructed system.

3.2.1 Phase One: Teasing Apart

This stage helps people understand and 'distil' the nature of an experience, resulting in a table showing how the experience breaks down. There are five steps:

1) **Briefly describe the functionality and the experience of using it**. For example, if we were teasing apart photo-sharing on Facebook, we might write: "Facebook allows users to users to upload and caption photos, which can be commented upon by the photo's owner or other users. Viewers can 'tag' friends in photos, adding metadata which links images with people's profiles."
2) **List the 'surface elements' of the experience**. These are nouns and adjectives relating to the design. For example: a somewhat complex photo upload process; the option to caption images; the option to 'tag' images, indicating who is shown; the option to view photos
3) **List 'experienced effects'**, which focus on physical, social, intellectual and emotional effects, and tend to be abstract nouns, noun/verb pairs and adverbs. There are two types:
    a. Literal: concrete items, e.g. 'broadcasting visual information' and 'sharing past experiences'.
    b. Abstract: relating to emotional and intellectual effects, such as 'presence in the community', 'openness about past experiences', 'anticipation of discussion', 'reminiscence', and 'uncertainty about responses and audiences'.
4) **Identify effects which seem especially important, unique or key**. E.g. 'broadcasting visual information', 'presence in the community', 'openness' and 'reminiscence'.
5) **Describe the abstracted experience in a neutral sentence**. Use the information generated, particularly key effects, to describe the experience in one sentence. Keep this sentence neutral: for example, mention 'broadcasting' information rather than 'playing' it, as the latter implies an audio-visual modality. One might write of photo-sharing, 'A way to share and annotate imagery from the user's past; their audience can view and annotate that imagery'.

The list of elements and effects will vary in length according to the experience considered, as will how many effects are key.

3.2.2 Phase Two: Piecing Together

This phase is a creative tool for generating ideas: users redesign a teased apart experience in a new context. Output is a description of the redesign. There are many ways to re-provide an experience, so there are no 'wrong' answers. Steps are:

1) **Brainstorm, particularly using key effects**, considering the new context of implementation. One might consider modality, technology and scale, and what technologies traditionally occur in the original and new environments.
2) **Use these ideas to build a reconstructed scenario**.
3) **Check the reconstruction**:
    a. Were all desired effects included? (Choosing to omit some key effects is fine.)
    b. Were any unintended key effects introduced?
    c. Refine the scenario accordingly, repeat these steps as needed.

A possible description of re-providing photo-sharing at home is:

'A novel tabletop to display a sequence of photographs chosen by the table's owner. It incorporates a touchscreen interface to allow the owner to lay down photos and annotations. Passers-by can annotate photographs with commentary.'

This example demonstrates TAPT's use: the abstract description bridges the contextual gap between 'uploading photographs to a website' and 'a semi-public tabletop display'.

4. EXPERIMENT

Initial tests applied TAPT to facets of SNS: messaging, microblogging, photo-sharing and groups. These have been described elsewhere [21] [12]. To acquire fuller results, a comparative evaluation was conducted in December 2009. Software engineers worked in groups of two or three to carry out design exercises. In each exercise, participants used one of three

approaches (described in Section 4.1) in response to one of three experiences (described in Section 4.2): each time, participants were allocated a different exercise and a different method.

After each exercise, participants filled in a questionnaire on how well the method lent itself to the task. At the close of each session, a group discussion let participants air strong views.

43 people took part, forming 21 groups. Each group produced two artefacts (design outputs from one of the three methods). Groups were randomly allocated to methods and tasks.

Participants were software engineers based either at IBM's Hursley laboratory or at the University of Southampton. Most were British citizens, and this alongside their professional status means a certain homogeneity is evident in their approach to problem-solving and perceptions of the tasks they were set.

4.1 Method Descriptions

Three methods were provided.

The first was TAPT, described in Section 3.2. Participants were given instructions and examples (online Christmas crackers online and photo-sharing at home).

The second method was Scenarios and Personas, chosen as representative of current design practice (based on conversations with UX professionals). Participants given a description which boiled down to these steps, drawn from Cooper [3]:

1. Brainstorm around what it is you need to design.
2. Consider types of user of the system you're designing (personas), and create the persona(s) which seem key.
3. Construct high-level scenarios of system use, from the user's perspective.

Cooper's example persona and scenario were also included [3].

The third was No Method, included as a neutral baseline against which the other approaches could be judged. It was presented to participants as a 'group discussion', and described as follows:

"A very informal method, this simply involves carrying out a verbal discussion within your group about how to solve the problem at hand. Please do not write or draw ideas during your discussion, but write a paragraph describing your envisioned design once you have decided upon its details."

Users of No Method were asked not to produce freeform notes as an aid to thinking (other participants were able to do this). No Method would never be used in practice, but was included to test the quality of output produced without any support at all.

4.2 Task Descriptions

Participants were asked to design two of three systems:

1) a website to reproduce the experience of picnicking with friends (physical to web)
2) broadcasting and browsing SNS 'status updates' (microblogging) using pervasive technologies in an elderly people's home (web to pervasive)
3) providing a collaborative feedback area of a museum, inspired by wiki technology (web to physical)

Task descriptions were thus:

"Original experience: picnicking with friends.

New experience: A company which sells picnic products have asked you to design a website which re-provides the experience of enjoying a picnic with friends. They have plentiful funding and it is clear that (if it is helpful for achieving your goal) you are welcome to apply technology in novel ways."

"Original experience: reading, writing and commenting on status updates on social networking sites.

New experience: A care home for the elderly have observed interest from their residents in strengthening their community. Inspired by social networking sites such as Facebook, they are interested in building a system to enable residents to provide short 'status updates', alongside the ability to access and comment upon updates from other residents. The system will be used only by old people, living in the home: it caters for a relatively small network of people. The care home ask you to design this system."

"Original experience: Reading and extending a wiki.

New experience: A museum about the Berlin Wall have been awarded funding for an extension. They want to create an area where members of the public can provide comment: the aim is that contributors will share their experiences, thoughts and feelings about the Berlin Wall. The museum is keen to use technology to encourage people of all ages and backgrounds to contribute and want to replicate the feel of Wikipedia."

4.3 Allocation of Methods and Tasks

The researchers did not allocate the same method or task to participants across the two exercises, because prior experience with either during the second exercise would affect results. Instead, groups were allocated to equally distribute method order. For example, an equal number of groups applied TAPT followed by No Method, as applied No Method followed by TAPT. Similarly, the order of tasks varied across groups.

To illustrate this, Table 1 shows the group, task and method allocation of the first five participants:

Table 1. Allocation of groups, tasks and methods

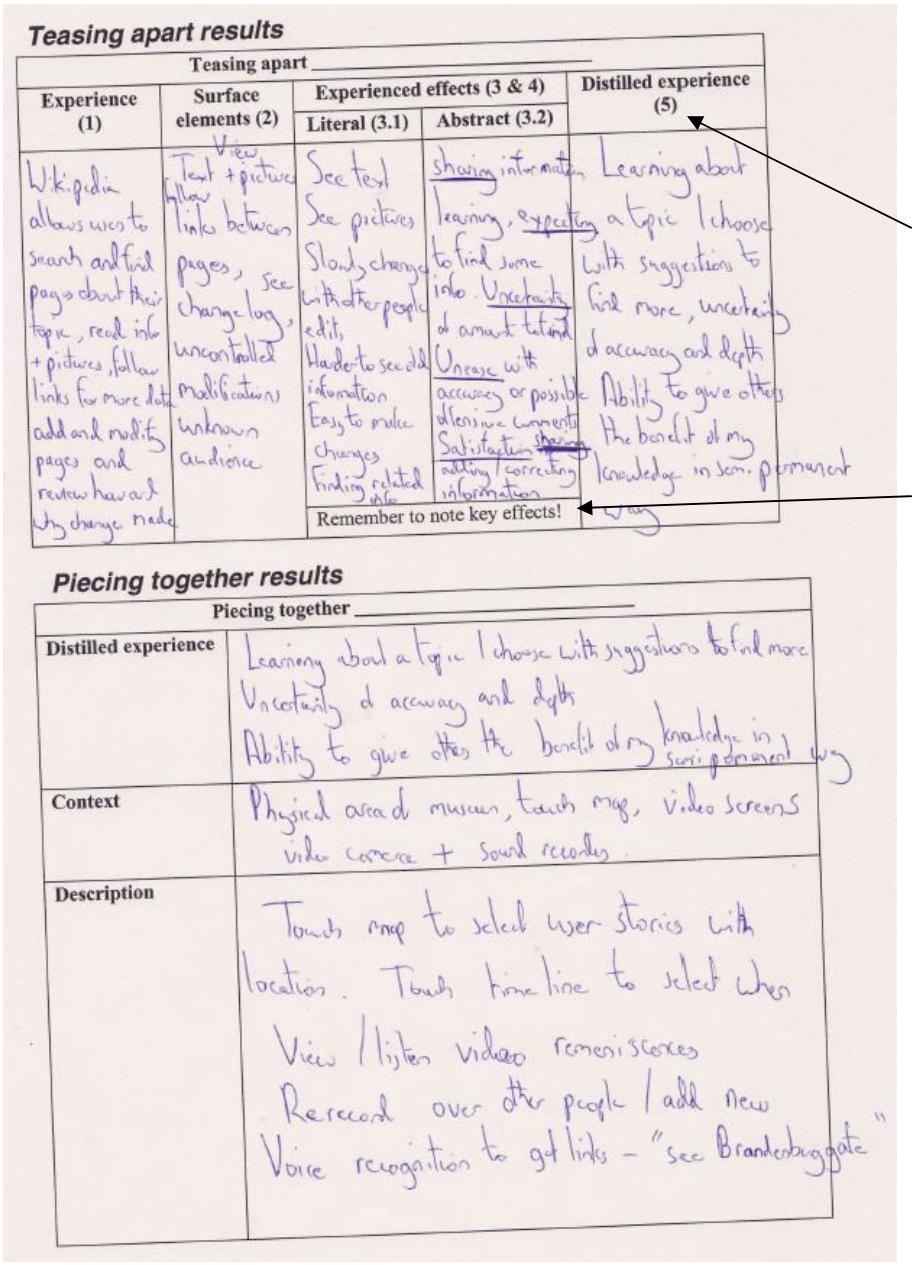
Participant	Group	First method and task	Second method and task
1	A	TAPT Wiki	Scenarios Picnic
2			
3	B	TAPT Microblog	None Wiki
4			
5	C	Scenarios Microblog	TAPT Picnic

4.4 Questionnaires

Participants were given an opening questionnaire (concerning prior experience in software design, to contextualize results), a questionnaire after each task, and a closing questionnaire.

The main questionnaire was given after each task. The bulk of this was a table of Likert-scale questions on the usefulness of the method for understanding and replicating experience. There were four questions on understanding and four on replication: the first two concerned overall usefulness for understanding / replicating hidden meanings, while the next six delved into three particular aspects of hidden meanings: emotional aspects, social context, and user perceptions and expectations.

The final part of the main questionnaire addressed whether methods provided: a vocabulary for discussion; structured, systematic approaches; an audit trail / ability to explain choices; support for creativity; usable artefacts; replication of superficial aspects. Some of these included Likert-scale style tick boxes.



An A4 page was provided to each group using TAPT, for recording output. In this example a group records the TAPT process for Task 3 (a collaborative area in a museum inspired by wikis).

The table for output was annotated with numbers indicating the step of the process relevant to each text box.

The Teasing Apart table included a prompt to underline key effects

The use of a physical form guides participants in terms of how much detail is expected in each stage, encouraging clarity.

At the end of the process the form acts as a design artefact, recording observations and decisions made and providing a simple audit trail of the creative process.

Figure 1: Redesigning a wiki for use in a museum

The final questionnaire asked three comparative questions: which method was easier to use, which produced more useful results, which was more effective at replicating experience.

5. RESULTING ARTEFACTS

In this section, we describe and discuss the 16 artefacts produced with TAPT in response to the three exercises. As demonstrated by the example in Section 3.2, applying TAPT results in clear, tangible artefacts. Figure 1 shows TAPT used to analyse wikis and rebuild them in a museum context.

5.1 A 'Picnic' Website

Six picnic systems were designed using TAPT, including two websites to deliver food for real-time consumption while conferencing; two online shops with games and social aspects; one public area (virtual food, chat, activities); one chat site with picnic-related alerts (bees, rain). One example design was:

> *A website that allows friends to 'meet' in a 2D or 3D virtual space. Environment could be customised by host/users eg. beach, field etc. real time discussion. Ideally would be integrated with other social networks e.g. Facebook to allow inviting and creation/scheduling of the event.*
>
> *Product can be selected from company catalogue, e.g. picnic rug and ordered if desired. Birdsong/background noises played to participants alongside speed.*

5.2 Microblog Updates in a Care Home

Five groups applied TAPT to this problem. Despite similarities in the analyses produced by Teasing Apart, the Pieced Together

implementations were diverse. Of the five visions, two used handheld systems for voice or visual interactions, one used a menu-based TV interface, one used a web interface, and one used a multimodal tablet. Two included voice-based updates, and all used visual update methods. One example design was:

> *A wireless touch screen tablet with a very simple UI. Display consists of a few large buttons for simple functions. Eg. "Post Status," "Read," "Comment" etc. These buttons are contextual. Device allow [sic] text-to-speech output. Each user has their own device so authentication is not required. Status can include pre-canned sentences. These are global to the community and can be added by any capable user. Status can be added automatically (RFID Positioning etc). Text input via on-screen keyboard.*

5.3 A Wiki-inspired Area for Museum Visitors

Six groups used TAPT for this problem, producing five clear designs. In contrast to the microblog designs, designs were relatively similar. Two used interactive walls, one a non-interactive wall, one a touchscreen, and one an interactive whiteboard. Three allowed voice or AV input, two were multimodal, and one used video only. Interestingly, 4/5 designs made it possible for museum visitors to edit one another's shared experiences. One example design was:

> *An interactive white board that is editable by anyone who picks up the pen. Content is archived and old entries fade to create spaces to entice new contributions. Users may choose to translate others' experiences or add photos. Content is sent to a traditional wiki for sharing and collaborating remotely.*

5.4 Discussion of Artefacts

Groups generally came up with similar experienced effects and distilled experiences, but quite different visions. Effects did appear to be transferred to designs and distilled experiences influenced designs, as one would expect. For example, one group described distilled wiki-use as "Collaboratively publishing an always-current topic-organised content base, with history", which clearly informed their end design.

Wiki designs were often but not always wall-based. Despite wikis having more complex interfaces than microblogs (i.e. more surface elements), analyses of each led to similar numbers of experienced effects. This may be due to the constraint of the size of the table which participants filled in.

Analyses of picnicking again led to common effects. Implementations were fairly similar, and mostly rather disappointing: the picnicking task was chosen to be challenging, but responses generally involved enabling people to eat at their computers while conferencing, rather than replicating the meaning of picnics in other, less obvious ways.

Although distilled microblogging experiences were similar, results were diverse. We speculate that the microblogging scenario translates more directly into a feasible system than the other scenarios, meaning that participants didn't have to work so hard accommodating elements which might not fit naturally.

6. UNDERSTANDING EXPERIENCE

Participants rated how useful methods were for understanding experience overall, and for understanding emotional aspects, social context, and user perceptions and expectations.

Table 2: Responses on understanding experience

Type of understanding	Method	Percentage of method users to tick each response		
		Very Well / Well	Ok	Badly / Very Badly
Overall (Figure 2)	TAPT	75	22	3
	Scenarios	50	29	21
	No Method	45	36	19
Emotional (Figure 3)	TAPT	69	19	12
	Scenarios	46	29	25
	No Method	37	25	38
Social context	TAPT	58	26	16
	Scenarios	48	35	17
	No Method	30	47	23
Perceptions and expectations	TAPT	47	37	26
	Scenarios	41	34	25
	No Method	7	45	48

Concerning overall understanding, participants found TAPT the most useful method, particularly commenting on its analytical qualities ("Separating literal & abstract was useful to improve understanding"; "It made me analyse what was happening"; "Helped understand key aspects"). This is in contrast to Scenarios ("Didn't really cover the original experience. Focused on the new"; "Needed analysis to think of personas") and No Method ("It was very easy to skip past the original experience"; "We didn't analyse [the original experience]"). It appears that TAPT's analysis phase enabled deeper understanding of the original experience.

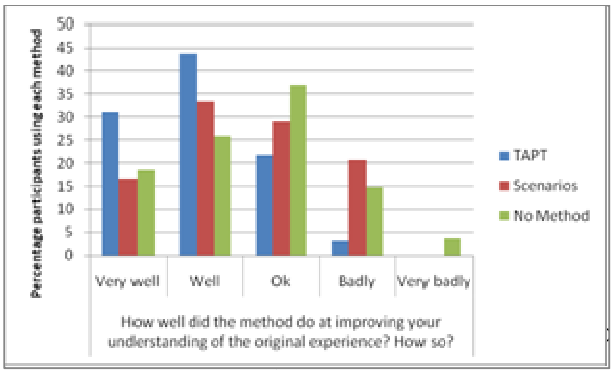


Figure 2: Responses on understanding experience

The next three questions (on emotional, social and expectation-related aspects) concerned a subset of overall usefulness, and responses followed a similar pattern.

In terms of emotional aspects, TAPT was mostly highly rated. Comments suggest that this is due to its analysis phase ("It made you think about what emotions we experienced when using a wiki that you don't realise you experience."; "This has opened my eyes to see why these feelings come into play").

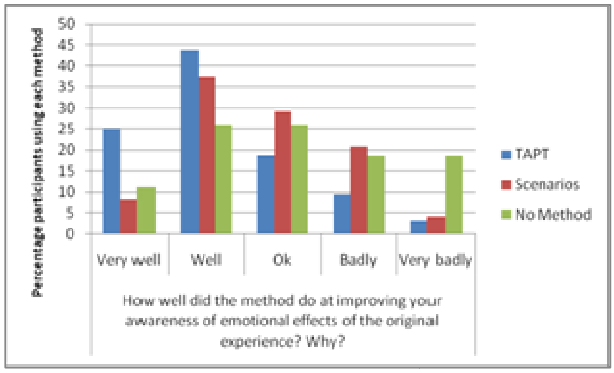


Figure 3: Responses on awareness of emotional effects

Scenarios users were less enthused ("Doesn't encourage thought about the original experience"), although were somewhat positive ("Get to see why people actually use it and how it affects them."). Users of No Method were generally negative about the lack of prompts to consider this area ("Didn't spend much time talking about this"; "We assumed we were v. familiar with the original experience & didn't analyse it.").

Concerning understanding social context, the three methods were more closely ranked, although again TAPT led. (Scenarios likely did better here due to its user focus.) Again, positive comments related to analysis: "Drew out essentials"; "Formed a lot deeper meaning to social side of picnic"; "Got us to think things through". Some negative comments emerged: "Didn't consider goals, motivation etc" and "Didn't focus on social context". Scenarios users were also split: one said "didn't really cover the original experience" compared to "This method is geared directly at doing this". Those who used No Method were more negative: "We failed to consider this factor".

Regarding understanding perceptions and expectations, TAPT and Scenarios were rated similarly, ahead of No Method: probably this was due to the advantages of Scenarios' user-focus and TAPT's analysis. Positive comments on TAPT centered on increased knowledge ("Made you think about using a wiki differently"; "More thought put into how OAP users would view this phenomenon"), although some commented that TAPT could focus more on changes in user state or on users in general. Scenarios users commented positively on its user-focus, but some felt it didn't necessarily help or cover this area. One No Method user 'thought extensively about user attitudes, purposes', but in general comments on this method were negative, presumably due to the lack of prompts to consider this area.

7. REPLICATING EXPERIENCE

Table 3 summarises responses on experience replication.

On replicating experience in general, TAPT fared less well than Scenarios, which fared less well than No Method. Most negative remarks from TAPT users concerned the nature of the original experience (e.g. "The wiki concept does not translate well to a physical museum."; "The original is all about physical experiences (food + environment) so difficult to reproduce well."), while positive comments concerned successful re-provision of key features of the original experience.

One scenarios-user was rather cautious ("Without interviewing users, its difficult to say if we were accurate"), but most were positive ("I think it does cover all of the original experiences.").

No Method users were very confident indeed, with comments such as "We think it does"; "Nearly all aspects covered"; "it's about as good as you could expect from a website".

Table 3: Responses to questions on replicating experience

Type of replication	Method	Percentage of method users to tick each response		
		Very Well / Well	Ok	Badly / Very Badly
Overall (Figure 4)	**TAPT**	52	35	13
	Scenarios	62	30	8
	No Method	70	22	8
Emotional	**TAPT**	64	23	13
	Scenarios	62	26	12
	No Method	47	26	27
Social context	**TAPT**	59	31	10
	Scenarios	52	35	13
	No Method	63	22	15
Perceptions and expectations	**TAPT**	47	46	7
	Scenarios	52	31	17
	No Method	27	66	27

TAPT's low ranking here may seem surprising as it is intended to capture experience. This result may be because it encourages people to *reimagine* an experience, thus making it superficially less like the original (consider the above quotations about the difficulties translating experiences). We speculate that after carrying out a deep analysis of the starting experience, TAPT users were particularly aware of aspects which they had *not* replicated, and therefore rated their results less well than otherwise. Possibly related, users of No Method were very confident in their comments: this may be borne of the lack of structured thinking provided by the other two methods.

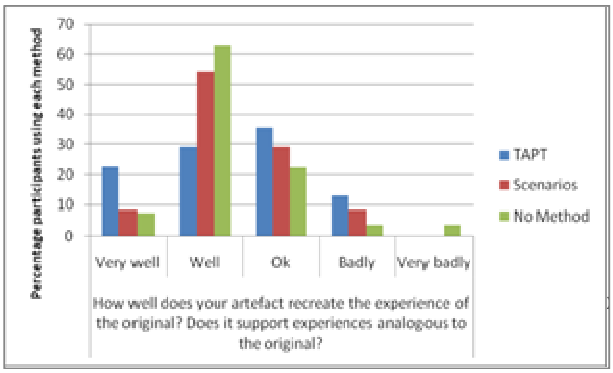


Figure 4: Responses on recreating experience

Concerning replication of emotional aspects, TAPT and Scenarios did similarly well, followed by No Method. Notably, No Method had the most ratings of 'Very Well', perhaps reflecting the greater confidence of users of No Method.

In terms of replicating social context, all three methods were rated similarly: this could be because the three tasks all

concerned social situations, and thus perhaps the subject matter prompted consideration of this area regardless of method.

Concerning replication of changing expectations and perceptions, TAPT and Scenarios again did similarly well, followed by No Method: TAPT and Scenarios were never rated as doing 'Very Badly' at this.

8. OTHER RESPONSES

Further questions concerned methods' efficacy at scaffolding discussion, supporting creativity, providing professional output, providing structure, and replicating surface design elements.

Detailed analysis of these results is beyond the scope of this paper, but participants were supportive of TAPT and Scenarios' ability to scaffold discussion, and rated No Method as the best at supporting creativity. Participants felt that output from TAPT and Scenarios was much more suited to workplace use than output from No Method (comments on TAPT noted the intuitive layout and ability to trace decisions. Some suggested allowing use of flow charts and diagrams). Participants were positive about the structure in TAPT and Scenarios, with no Method users split: some enjoyed the lack of formality but others found it very easy to get sidetracked. One participant summarized, saying: "structure => thoroughness, no structure => creativity".

Interestingly, many TAPT users rated the method as doing well at replicating surface design elements. We didn't expect TAPT to do well at this: users appeared to dislike rating it badly in this respect as they chose not to replicate surface elements. Saying it was very bad implied that they wanted to achieve this goal but couldn't, rather than choosing not to (indicated by comments such as "We deliberately tried to be different from the wiki" and "We intentionally changed them all").

9. COMPARISON OF METHODS

At the end of the study, participants were asked three comparative questions to elicit which method was easier to use, which produced more useful (powerful, practical, relevant) results, and which was more effective at replicating experience.

Some didn't answer, because the methods were applied to very different tasks: "the scenario (social networking) itself was more amenable to replication than the wiki one"; "I think the second task hindered TAPT's potential strengths."; "the experience was almost impossible to replicate fully".

Table 4: Results of comparison

Methods compared	Scenarios and No Method		Scenarios and TAPT		No Method and TAPT	
	S	NM	S	T	NM	T
Ease of use	4	5	7	7	12	4
Useful results	7	1	4	8	4	9
Replication	5	5	1	11	5	7

Unsurprisingly, the fast, unconstrained No Method was rated as easiest to use. TAPT and Scenarios were rated equally easy to use. Participants felt that Scenarios produced more useful results than No Method, but that TAPT produced the most useful results. Finally, participants rated TAPT as best at replicating experiences, with Scenarios rated better than No Method.

It is interesting that participants claimed to find TAPT better at replication in response to the comparative question, when in the main questionnaire fewer TAPT users rated it well than with other methods. This difference is likely due to changing perceptions of participants over the course of the study.

10. SUMMARY AND FUTURE WORK

Table 5 shows the strengths and weaknesses of the three methods as elicited from participant responses.

Table 5: Strengths and weakness of the methods

Method	Strengths	Weaknesses
TAPT	Builds understanding Structured, systematic Can foster creativity (analysis leaves users at good starting point) Documents suited to workplace Thorough Logical process Documentation Good at replicating experiences	Lacks user focus Learning curve Structure can distract from creativity Formal process can get in the way of productivity Takes some time to apply Can be difficult to choose which aspects of an experience to replicate
Scenarios	User focus Structured, systematic Can fosters creativity (though creation of personas) Documentation	No focus on a starting experience No focus on changing user state over time Structure can distract from creativity Formal process can get in the way of productivity Learning curve Takes some time to apply
No Method	Fosters creativity Easy to use Fast to use No process to distract	No prompts to consider different aspects May lead to over-confidence in results No structure or focus Output unsuitable for workplace

Clearly, no one method will suit all circumstances. However, knowing the strengths and weaknesses of methods allows us to apply them together in an appropriate way. Some participants alluded to this ("Need a combination. TAPT good for key features. Scenarios good for user relevance.", "[No Method] is really only one stage in a process."). One participant described Piecing Together as "essentially just (.) [No Method] (.) but with all that (.) specific detail written down to guide it," adding, "I think that putting them together worked well."

It appears TAPT meets our goal of enabling translation of experiences, as abstracting ideas frees users to be creative. For example, one comment was "The distilled experience forced a more abstracted idea, which helped reshape the experience much more easily." Participants did not always immediately take to TAPT, but generally found it useful: "The problem was broken down into smaller seemingly unnecessary steps which actually helped in understanding and approaching the problem at hand."

Participant feedback suggested greater benefit could be gained by applying TAPT at multiple points through the sequence of an experience, and to multiple users within an experience. This returns to the concept of combining methods: for example, one might apply Scenarios and Personas to elicit user groups, and then apply TAPT to each usage scenario.

One participant commented "personal experience makes a huge difference": it is difficult to analyse experiences with which you are unfamiliar. Another aspect of future work is to consider how groups can apply TAPT, and ideal group size and composition.

Participants' experience using TAPT may have affected their value-judgments about their created artefacts. We therefore plan to evaluate the artefacts in a blind review, to more objectively establish how well they replicate experiences. In particular this may help elicit whether No Method users were over-confident about how well their artefacts replicated experience.

Finally, we plan case studies examining TAPT's use in domains such as e-learning, pervasive computing and social technologies.

11. CONCLUSIONS

We have presented TAPT, a method for understanding and redesigning experiences across different contexts. The results of our trial suggest that the strength of TAPT is its ability to provide a structured method for thoroughly exploring all the factors of a given experience, including those emotional and social effects that might otherwise be overlooked.

TAPT was used to understand and re-design various physical and digital experiences: it appears to be an effective tool for analysis and design that could complement existing methods. Teasing apart physical experiences allow us to implement richer, accessible web-based interactions inspired by these experiences, and TAPT is a valuable tool for re-providing experiences such as browsing social websites via novel, accessible mechanisms.

12. REFERENCES

[1] Bardzell, J., Bardzell, S. Interaction Criticism: A Proposal and Framework for a New Discipline of HCI. In *Proceedings of the CHI* (Florence, Italy, 2008). ACM.

[2] Buchenau, M., Suri, J.F. Experience Prototyping. In *Proceedings of the DIS* (New York, USA, 2000). ACM.

[3] Cooper, A., Reimann, R., Cronin, D. *The Foundations of Design: Scenarios and Requirements*. Wiley, City, 2007.

[4] Dix, A. *Deconstructing Experience - pulling crackers apart*. Kluwer, City, 2003.

[5] Forlizzi, J., Battarbee, K. Understanding Experience in Interactive Systems. In *Proceedings of the DIS2004* (2004).

[6] Gamma, E., Helm, R., Johnson, R., Vlissides, J. *Design patterns : elements of reusable object-oriented software*. Addison Wesley, 1995.

[7] Gaver , W., Bowers, J., Boucher , A., Gellerson, H., Pennington, S., Schmidt, A., Steed, A., Villars, N., Walker, B. The Drift Table: Designing for Ludic Engagement. In *Proceedings of the CHI* (Vienna, Austria, 2004).

[8] Gould, J. D., and Lewis, C. *Designing for usability: key principles and what designers think*. City, 1985.

[9] Hart, J., Ridley, C., Taher, F., Sas, C., Dix, A. *Exploring the Facebook Experience: A New Approach to Usability*. ACM, City, 2008.

[10] Hassenzalh, M., Tractinsky, N. User experience - a research agenda. *Behaviour and Infomation Technology*, 25, 2 (2006), 91-97.

[11] Hirsch, T., Forlizzi, J., Hyder, E., Goetz, J., Stroback, J., Kurtz, C. The ELDer Project: Social, Emotional, and Environmental Factors in the Design of Eldercare Technologies. In *Proceedings of the ACM Conference on Universal Usability* (Arlington, Virginia, United States, 2000). ACM.

[12] Hooper, C., Millard, D.E., Stanford-Clark, A. Tugging at the Seams: Understanding the Fabric of Social Sites. In *Proceedings of the Grace Hopper Celebration of Women in Computing 2009* (2009).

[13] Hughes, J., O'Brien, J., Rodden, T., Rouncefield, M. and Viller, S. Patterns of Home Life: Informing Design For Domestic Environments. *Personal technologies*, 4, 1 (2000), 25-38.

[14] Isomursu, M. User experience evaluation with experimental pilots. In *Proceedings of the CHI* (2008).

[15] Keyani, P., Hsieh, G., Mutlu, B., Easterday, M., Forlizzi, J. DanceAlong: Supporting Positive Social Exchange and Exercise for the Elderly Through Dance. In *Proceedings of the CHI* (Portland, Oregon, USA, 2005).

[16] Madsen, K. H. A Guide to Metaphorical Design. *CACM*, 37, 12 (1994), 57-62.

[17] Mahlke, S. Understanding users' experience of interaction. In *Proceedings of the 2005 conference on European association of cognitive ergonomics (Greece, 2005)*.

[18] Namazi, K. H., and McClintic, M. Computer use among elderly persons in long-term care facilities. *Educational Gerontology*, 29, 6 (2003), 535 - 550.

[19] Nanard, J., Nanard, M. Hypertext Design Environments and the Hypertext Design Process. *CACM*, 38, 8 (1995), 49-56.

[20] Newell, A. F., and Gregor, P. Design for older and disabled people - where do we go from here? *Universal Access in the Information Society*, 2, 1 (2004), 3-7.

[21] Owens, C., Millard, D., Stanford-Clark, A. *Methods for Re-imagining Social Tools in New Contexts*. City, 2009.

[22] Perry, M., Dowdall, A., Lines, K. and Hone, K. Multimodal and Ubiquitous Computing Systems: Supporting Independent-Living Older Users. *IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE*, 8, 3 (2004), 258-270.

[23] Plaisant, C., Clamage, A., Hutchinson, H.B., Bederson, B.B., Druin, A. Shared Family Calendars: Promoting Symmetry and Accessibility. *ACM Transactions on Computer-Human Interaction*, 13, 3 (2006), 313–346.

[24] Sengers, P., Boehner, K., David, Sh., Kaye, J. Reflective Design. In *Proceedings of the AARHUS* (2005). ACM.

[25] Sengers, P., Gaver, B. Staying Open to Interpretation: Engaging Multiple Meanings in Design and Evaluation. In *Proceedings of the DIS* (2006).

[26] Wiley, J., Sung, J., Abowd, G. The Message Center: Enhancing Elder Communication. In *Proceedings of the CHI* (Montréal, Québec, Canada, 2006).

[27] Wright, K. Social support within an on-line cancer community: an assessment of emotional support, perceptions of advantages and disadvantages, and motives for using the community from a communication perspective. *Journal of Applied Communication Research*, 30, 3 (2002), 195-209.