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Beyond Search: A Technology Probe Investigation

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Beyond Search: A Technology Probe Investigation

ABSTRACT

This paper reports on the use of two probes to investigate what might be user activities that go beyond search as traditionally conceived. In particular, it reviews the state of play for user experience with search engines, the form of web use more generally, and then describes the design of Cards and Pebbles, two search engine-based probes developed to help elicit new concepts for web based experiences. These probes were provided to six households for up to four weeks. The householders' responses to these probes and their reflections on new forms of tools for web engagement that their use provoked are analysed and reflected upon, as are the advantages and limits of the probe method.

Author Keywords

Search, probes, qualitative research, Cards, Pebbles

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Popular search engines such as Google and Bing provide users with extremely relevant 'results lists' based on entered keywords. These search engines are so useful they have become a "Newtonian paradigm for the web" powerfully guiding users' understanding of it. At the same time, they may also "constrain (our) ability to imagine other ways to ask questions that might open up new and more powerful possibilities" [25:p.52]. Although developing predictive models of human-web interaction is important [3,7,17, 32], it is equally necessary to continue envisioning new ways to interact with web content – to go beyond search, as it were. In our view, researchers attempting to develop new web interaction tools should consider an array of user motives beyond query-based search and fact-finding. Such a focus does not ignore the importance of designing better, perhaps more intelligent search tools, rather it raises awareness that users also possess a multitude of other motivations that might lead them onto the web. These might be exploratory, playful and instrumental, amongst many other possibilities, and may take them beyond search activities as currently understood.

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This paper presents a case study of two technology probes, Cards and Pebbles, which were designed to help identify some of these motivations. We did not think that these probes would uncover all of the motivations in question, nor did we think that the design of the probes themselves would be without imposing their own constraints on how people perceived what they might do on the web. But the use of probes, alongside complementary research entailing in-depth diary and ethnographic studies of search engine use (and the web more generally) offered what we believed would be a useful approach to discovering what these motivations might be. We also thought that this approach would offer clues to the invention of technologies that would enable people to pursue these new motivations.

This paper will, first of all, review the state of play in understanding web use and search tool use in particular. It will then review more generic research (some of it outside HCI) that is looking at what leads people to the web and what keeps them on it, search motivations included. This will lead to consideration of our approach to specifying what technology probes might do. It will then describe how we engineered the probes, and then present findings from a field study in which the probes were used by five households for up to four weeks. Data from this study consisted of qualitative interviews. This interview data was then used to identify motivations, some of which were related to how search itself might be enhanced to satisfy new motivations, and some of them having to do with new undertakings, ones beyond search as it is currently understood. The paper will conclude with a design implications section where we outline the criteria required for two new 'beyond search' tools.

TYPOLOGIES OF WEB USE

HCI researchers have long developed typologies of web access and use [1,13,15,19,24]. For example, in a much cited paper, Sellen et al. [26] combined diary and interview data to analyze the web goals of 24 knowledge workers and found that they engaged in 6 main activities: information gathering (35%); browsing (27%); finding (24%); transacting (5%); communicating (4%); and housekeeping (5%). Kellar et al. [15] asked focus group participants to categorize different information seeking activities on the web and this produced a typology consisting of fact-finding, information gathering, browsing, and transactions.

Meanwhile, many more studies have looked at search engines and their use. Most of this research was derived

from a classical model of information retrieval [23] in which users possess a desire for information, articulate that desire as a keyword query, and scan results listed by probable relevance. Search engines attempt, in various ways, to provide users with the quickest possible path to information. In this regard, they are not simply tools to find facts and retrieve information; they are navigational aids too.

Currently, a great deal of effort is being put into improving the search process via, for example, intelligent search engines that consider such things as personal history and other factors including context and language. This research goes back a long way, as our remarks about search being so canonical in HCI suggest (see for example [7,17]. For some of the more recent research see [32]). All of these efforts are intended to provide more accurate results to more specific user queries.

Although such enhancements could offer great benefits for web users, many web uses fall outside the classical model of information retrieval. It is hardly surprising then to discover that many researchers want to break free from this standard view. Exploratory search paradigms have recently broken free of the classic query-response model of information retrieval, for example, to envision different forms of web interaction (e.g.32). Here, new tools are being built that turn around richer models of user action; here tools are being built that stretch search into new forms, ones that afford different experiences for the user.

Facetted search tools, for instance, articulate connections across a data set that may not be obvious to users under normal circumstances. As a case in point, the Relation Browser data analysis tool [2] allows users to explore connections in large databases by lining up results into an easily interpretable grid. Similarly, LifeLines [21] presents complex patient histories on a timeline that might help visualize trends and connections among attributes in the dataset (e.g. between heart attacks and various patient attributes.)

Other exploratory search projects have provided users with options for collaborative and interactive search. For example, MrTaggy [3,8,14,] combines traditional search results with interactive relevance tags gathered through web crawling. Similarly, SparTag [12] allows users to take notes that the system will associate with a webpage and display when a document is cloned. Dogear [18] likewise enables data sharing between collaborators wishing to annotate and bookmark a shared set of resources.

Other efforts have gone into breaking the search engine UX paradigm–that is to say, the list-based form of results display. Some are simply efforts to start the task, others are bolder. For example, http://www.exalead.com presents search results in a traditional list format but also incorporates a small snapshot of each. Taking the notion of snapshots a step further, http://search.spacetime.com presents results in a three-dimensional set of windows, each displaying a snapshot of a website relevant to the search terms. The results windows can then be shuffled through within the 3D space. Other web services have been designed to facilitate serendipity and social browsing by utilizing user ranking systems. For example, http://digg.com and http://delicious.com both present users with a list of potentially interesting results based on website rankings and popularity with other users. Similarly, http://stumbleupon.com constructs a user profile and aims to help users 'stumble upon' interesting websites based on their unique preferences and interests.

Dontcheva et al [6], meanwhile, have produced perhaps the most inspiring of all these exploratory search experiences by describing how a new GUI, emphasizing card-like content frames, can be combined with new ways of gathering or integrating search criteria. In this view, the user becomes the agent that constitutes ever more subtle and complex search criteria 'bundles'--bundles which reflect his or her natural interest and which evolve as they search the web. For example, a user may want to collect a list of nearby restaurants from one search, combine this with a list of reviews of those same restaurants in a second, and then link those to a real-time bus transportation site and then eventually present all of this mashed-up content in the same 'card'.

The wealth of this research attests to the vitality of HCI in this area. Indeed, one might say that investigations of search engine use and, on that basis, design specification of one kind or another has come to offer an almost canonical example of HCI-type research. It allows elegant combinations of empirically quantifiable human action with identifiable machine behaviors. In this view, the human task of finding depends on the technical task of indexing and retrieval, and the human desire to share and post material thus found necessitates the design of browsers that allow copy and paste functions (or their equivalent) and a linking to web creation tools of various kinds. It is no wonder, therefore, that this research area has been so rich for HCI.

But elsewhere, in other disciplines, taxonomies of web and search engine use are also common and might provide useful supplements to the HCI perspective. In communication and media studies, for example, scholars have developed typologies of web behavior that use what is called Uses and Gratifications theory (U&G). U&G theory provides an index of user motives and corresponding gratifications for any and all communication acts. Though it started with a concern for broadcast media and its consumption, the U&G perspective quite easily fits the topic of web content use and its consumption through search engines [29].

As long ago as 2000, [20] applied U&G theory and came up with a taxonomy of five motives for Internet use. In their view, web use was motivated by the utility it provided for the management of interpersonal affairs, for the passing of time, for information seeking, convenience, and

entertainment. Information seeking and entertainment were the most prominent combinations of uses and gratifications, the analysis showed. Similarly, [16] described a 7-factor structure of web use where social escapism, transactional privacy, informational needs, interactive control, socialization, non-transactional privacy and economic motivation were the motivators. As with the [20] study, information retrieval and escapism (their analogue to entertainment) were found to be most prominent.

More generally, U&G research suggests that acts of mediated communication can be characterized along different dimensions. The *content dimension* describes the uses and gratifications related to the information or messages carried through a medium [27]. The *process dimension*, which some researchers claim is overlooked, refers to motives and gratifications related to the inherent joy or pleasure that accompanies using a medium [5,29]. Web browsing, as a case in point, might be an enjoyable process that fulfills a user's need for entertainment or diversion [11]. More recent research from the U&G perspective also describes a *social dimension* for web use and highlights how the need for communication and social connection is provided through it [27,29]. The link between this and the social aspect in HCI and CSCW hardly needs stating [e.g., 3,8].

Although these web and search engine use typologies represent different disciplinary and methodological approaches, there is much similarity in them. Indeed, one can learn from this. Looking at this literature makes it clear that some motivations are much more prevalent than others. Information seeking and information retrieval is one of these; entertainment and escapism is another. Whether this is related to the design of the prevalent tools that let people engage with the web in these ways–namely via search engines for the first of these and via UGC tools for the latter (such as offered by YouTube) – or whether this is related to the predominance of these motivations in the first place is perhaps a moot point.

Even if we want to do so, however, we need to be alert to an important property of the way that people engage with the web. If it is the case that the web has expanded into a seemingly endless abyss of information, services, and portals, it is also true to say that wherever people go, and whatever they end up doing (information retrieval or entertainment, for example), in most instances it is search engines that people use to get there. The motivations behind this use are likely to very many, as diverse as the doings they seem to be part of.

And these doings are enormous in volume-and this is increasing incredibly. In 2005, search engines were utilized by 80-90% of Internet users [9] for example, with 41% using search engines on a daily basis [22]. But by 2010, more than 15.2 billion web searches being conducted in January of that year in the United States alone [4]. As it happens, one search engine over all others has become dominant–namely Google (65.4%), with Yahoo! (17.0%), Microsoft (11.3%), Ask (3.8%), and AOL (2.5%) fighting over the remains. If Google has attained dominance in the general domain, verticals within the web are often supported by their own search technologies, with sites such as YouTube, eBay, MapQuest, Facebook and Amazon all offering their own ways of searching within their domain.

Increases in the amount of search engine use do not mean an increase in the type or range of motivations, of course. It could simply mean more people doing the same things for the same reasons. Nevertheless, it should be clear from the proceeding discussions that even though people use search engines as a default point of entry to more or less all of their web activities, modeling their activity as various kinds of search will *not* suffice to capture what those people are about.

The scale of use should encourage us to broaden our thinking here. It justifies the claim that there is a need to look outside of HCI at other disciplines and their perspectives. But it also serves as a warning; one should not confine oneself to turn to those disciplines that end up offering approaches that still reduce human doing to sets of motivations that seem similar. The discussion of U&G approach is illustrative of this. This discipline is good at approaching human acts in terms of motivations and their gratifications. But this is a view that can look rather similar to that in HCI. One ought to be wary of assuming too much from integrating perspectives if those perspectives simplify in similar ways. Just as one can take certain lessons from bringing these particular disciplines together (such that there are two mains sets of motivation and uses that their empirical studies uncover), so one should take from a reading of the HCI and the U&G literature that there might not be one discipline that offers a complete analysis of all possible motivations and desires that lead people to the web (and to search engines in particular). Different scientific perspectives may highlight different sets, while some motivations may simply slip from view. As the Oxford philosopher P.M.S Hacking has noted [10], it would be a foolish person who thought human nature can be reduced to a simple set of motivations or one who thought that motivations remained always the same. Indeed, for certain kinds of activities explaining them in terms of motivations alone can distort the complex set of reasons that might explain some behaviours. Not everything is done with a motive after all. As we look now at what might be beyond search, so we might want to consider both how to satisfy already identified motivations and how we might devise tools that cultivate new ones from the larger vocabulary of human nature, whatever they might be; but we also want to look at behaviours that we might satisfy even if they don't have an obvious motive that we can design to. This somewhat odd possibility is something we shall come back to at the end of the paper.

DESIGNING WEB INTERACTION PROBES

It was with these sorts of concerns in mind that we developed our research probes. Our goal was to create probes that afforded new experiences. But we recognised that in the first instance these would have to be close enough to what users currently do to ensure that the users would easily grasp what the probes might be about. We wanted them to think about possibilities that went well beyond traditional search, but the importance and ubiquity of search in nearly all web-based behaviours meant that we would have to piggy-back on search somehow. Some of the technology of search might have to be relied upon, perhaps, some of the UX principles and practices too.

We approached the task of defining our probes by thinking, first of all, about the kinds of metaphors that encapsulate what beyond search might entail. A number came to mind, but two seemed especially appealing. The first related to the idea that people might use web content as a way to create things. It is this that underscores the Web 2.0 banner, of course, and whatever one feels about it, it has much currency. We were also inspired by [6] which explained how users could be allowed to make up their complex search bundles, but were concerned not to develop something that seemed to make the user even more search obsessed by, or more suffused with, search-like concerns. Though we liked that paper, we thought moving from current search experiences to what might be called a kind of search "mash-up" was a step too far for what we wanted to achieve. Nevertheless we came to the view that users might easily comprehend the idea of collecting stuff from the web and making something or other with it. The word "gathering" came to mind and the idea that people might use content they had retrieved to create informational objects of some kind. These objects could be kept, even shared. This led us to think about the Cards metaphor in the Dontchova paper. In that, the label was simply used to describe a format, but the word for us evoked the cards that used to be found in cigarette boxes. These would display images and facts about famous sports stars-the finder of these would not make up the content or fill them out, but would simply relish the ownership of them. This in turn lead to the idea of a probe that would consist of a search engine that would gather information according to users' direction, and would then make Cards of that information so that the user could keep and share that information if they so wished. The resulting probe came to be called Cards, accordingly.

The second probe derived from another metaphor. This had to do with the idea of travelling or voyaging. If it is the case that traditional search engines find things for people, we wondered whether it could also be the case that the search process could become a travelling one: a process that the user could experience. In this vision, the web is not a resource, but a place that one travels through.

There are many ways in which traveling might be conveyed, of course. For example, browsers already keep 'histories' and, despite the odd properties that cached and non-cached data have on user experiences of 'going back' through their browser, the flicking 'through pages' experience is certainly one that many users are familiar with. In this view, travelling on the web is like the hopping between pages that the early hypertext theorists hoped for. But we thought that 'pages of where I have been' would not be radical enough to get users to start to think differently about what beyond search might be – they already know that their searches produce histories of a sort. And what we also knew from our own experience and as well as anecdotally, such page hopping is cognitively taxing. Flicking through cached webpages disorientates.

This led us to think of another metaphor that might avoid this problem. We started to think about the idea of movement, that the web might have geography through which users moved. One of us used the expression 'Yeah, like going from one pebble of thought to another'. This caught our imagination; it lead is to think of how people wandered around beaches and would occasionally pick up a stone or pebble to gaze at its colours and shape. Pebbles could be the label given to the bits of information people picked up or walked on when they traveled on the web, and we could design a UX that reflected this. The result was an application called Pebbles.

Needless to say, metaphors are slippery things and their use in design is best undertaken wisely. But these ideas made us bumptious – we thought that these might be ways we could uncover some of the things that people would be keen to do. Pebbles and Cards might be tools to let us get there; they might even be appealing in their own right.

Unfortunately, as we started to specify the design of our two probes, doubts crept in. Perhaps the probes would afford experiences that would be too distant from what users were familiar with. Besides they might be too hard to make when the purpose was to use them as probes – not as prototypes of solutions.

Our response was to design both around a common architecture. Each probe would entail a GUI that rendered in a way that conveyed the experiences we wanted to highlight, but each probe would actually get its data by sending text requests to a standard search engine and then scraping content from these targets for rendering in the new GUIs. Also, each probe would offer the same basic starting point as current search engines – with a text based search term entry. We decided to alloy the familiarity of this by having each probe select some targets (from the search engine listing) randomly. Finally, the probes would combine text targets with related images to produce the GUI's we had in mind.

Cards

More particularly, the two probes functioned as follows. Cards allows users to enter "gathering terms" in a standard search box. The resulting hits (retrieved in a manner we

shall shortly describe) are displayed as a set of cigarette style Cards (See Fig. 1).

Figure 1. Set of Cards results and individual card

Each card is comprised of a section of text scraped from a webpage and a corresponding image gathered from Flickr. We hoped that pairing components from two separate web locations would provoke a sense of content generation and hence emphasise the creative metaphor that motivated our probe. By entering a set of gathering terms, users are able to essentially create unique web results in the form of a card.

Additionally we used a search algorithm aimed at capitalizing on randomness in addition to relevance. For example, rather than searching for an exact set of keyword terms, our algorithm searched for every possible combination of a set of gathering terms. Users are then given a random set of results that are in some way relevant to one or more of their entered terms.

Users can then select to view Cards individually by double clicking on a Card. Once a card has been selected, it opens in a new window and present users with the option to view the web page or view the image by clicking on either section of the card (as illustrated on the right of Fig 1.) Users then have the option to return to their set of Cards or revise the search in an attempt to find more Cards that are similar to the one they are viewing.

Cards provides users with several other options such as collecting Cards they want to save by dragging them down to a scrapbook bar on the bottom of the results page. Users can also drag a Card to the "Bing" icon on the bottom right corner of the results screen if they wish to conduct a traditional search using the text they discovered on a Card.

Pebbles

The Pebbles probe meanwhile uses the same algorithm as Cards to generate somewhat abstract results displayed as a piece of text with a corresponding image. Unlike Cards, however, Pebbles aims to capture the spirit of web travelling by visually reflecting the information journeys that users metaphorically undergo. Users begin their journey by entering keywords into a center pebble. Results are then displayed in circular set of seven results Pebbles (See images on the left of fig. 3). Users can select to view the image and/or webpage presented on a particular result Pebble and my also elect to use it as the basis of a new set of Pebbles. This process can be repeated as many times as desired, developing an increasingly large web of results that trace the steps of their journey. Such a set of results is represented in the right hand side of Fig 2. Users can return to Pebbles at any point in time and can navigate the larger set of results by zooming in or out on the screen. When users have completed a voyage they may reset the screen or save it for future reference.

Figure 2. Pebbles results and expanded voyage

FIELD TRIAL

The probes were deployed in a field trial near our lab in England. The purpose of the trial was not to test whether the metaphors embedded in the probes could be converted into products but was, as we say, to provoke the imagination of the participants – to help them move beyond the Newtonian paradigm of current search engines. We did not mind whether the participants used the probes frequently, whether they found them difficult to use, nor whether they desired them. Our purpose was to see what it lead the users to think was possible. If it is the case that current search engines have created a prism that constrains what people think the web might be, then our probes were intended to serve the same function as the probes. That is to say, they were intended to be a means of getting 'somewhere else', of 'uncovering possibilities'. If the web is something that is created in the moment of engagement with it, then our probes would provoke ideation about other ways of engagement, so we hoped. This in turn might provoke other ways of understanding what the web might be.

The field trial involved six households. Each was given a laptop with Cards and Pebbles as well as Google and Bing set as defaults on a browser. Each household was told how each probe could be used, but was also encouraged to view the probes as applications that were intended to make them think about new ways of interacting with web content. The installation of two standard search engines was explained as being intended to allow them to remind themselves of how constrained their prior web interaction had been.

Each household was asked to use both probes for at least 30 minutes twice for each week of the trial. Ideally each household was to have the probes for four weeks – though in two cases this was not possible as the families decided to have impromptu holidays 'given the weather' (this was

England after all). In those cases the probes remained in situ for only two weeks.

Each household was interviewed at the start of the trial. Here, they were asked to describe their normal web usage patterns, and any already existing ideas about how they might interact with the web in the future. A second interview was undertaken at the end of the first week where the participants were asked what they had undertaken with the probes and any initial thoughts on new tools for engaging with the web that derived from that experience. At this point they were reassured once again that the trial was not of the probes as products but was meant to be an opportunity for them to contribute their imaginative reflections on what the new web experiences enabled by the probes had conjured up. A third and final interview was undertaken at the end of the period. Here, the participants were encouraged to discuss whatever came to mind. All interviews were transcribed. The resulting findings and design implications derive from these transcripts.

The households were of the following kind. No attempt to select any particular type of household was made, except to ensure that each was as different from the rest as was practical. Difference here is of course a relative term – all were within twenty miles of our establishment; all were articulate and highly educated. The main differences were in wealth, age, and familial status.

Household A was a family with two parents and two teenage daughters. All family members described themselves as purposeful web searchers however the daughters noted that they occasionally play with Facebook and other fun sites.

Household B was a couple in their thirties. The husband worked in advertising and the wife was an orthopedist. The husband reported that he is frequently online for work purposes yet uses the web less frequently at home. The wife reported that she uses the web mainly for informational purposes and email and rarely goes online for fun.

Household C was a couple in their twenties who both worked as photographers. Both noted that the web is well integrated into their everyday lives for both informational and playful purposes.

Household D was a family of five including two parents, a son and daughter in their twenties and a 14 year-old son. The parents had begun using the web more recently and reported using it for informational reasons. The children reported using the web for school projects as well leisure activities such as Facebook, email, and following current events such as sports news.

Household E was a married couple in their twenties. Both reported that they frequently use the internet for a variety of purposes such as looking up important information and making purchases to browsing indulgent items they wish they could buy.

Household F was a family of four, including two parents and a young son and daughter. Both parents were in their forties and were knowledgeable web users.

FINDINGS

We will present the findings by considering the problems that the participants identified in our probes first before we consider the appeal that the probes also pointed toward. We then summarize these ideas as well as remark on the limitations of the probe method in this trial.

Confounding properties of the experience

All the participants commented on two closely related 'problems' with the probes (as they saw it). For some these were bigger concerns than for others, distracting one or two individuals so much that it inhibited their willingness to play with the probes at all.

The first of these problems had to do with the way both probes combined text and image. Recall that our results algorithm identified sections of relevant text and then ran a Flickr search on that text to find a corresponding image. This process worked quite nicely in many cases, yet sometimes matched up text and image that were seemingly unrelated. As one participant summarized "I might be looking for information on muffins and it will show up with someone's cat called Muffin."

We noticed this matching feature during our engineering phase yet thought it insufficiently worrisome to force recoding; besides we thought it might evoke a sense of serendipity and play. We even found ourselves saving Cards with amusing image and text match-ups. It turned out that some of our participants, in contrast, thought these were simply irritating. Sometimes they thought them perplexing mismatches that 'threw them off'.

Participants, in other words, did not appreciate this playful aspect in the matching of image to text. They described it as a technological glitch that distracted their attention and made it difficult to process the results. Several pointed out that the image component is "what draws you in, it's the hook" and yet found the image sometimes belied what the text said. Several remarked that they found it difficult to process a Card or Pebble when the image and text did not align in what they saw as a single related entity, a semantically relevant pairing.

Of course, in retrospect, this is perhaps not so surprising, with numerous previous researchers suggesting that users of search engines try to lessen their cognitive burden of interpreting results by processing those results heuristically – that is to say, by assuming that results bundled together in a list are 'somehow' and, on examination, 'self-evidently' related [34]. Our design did not help this– indeed undermined it even as the participants tried to do it. Moreover, the failure of the visual component to neatly summarize the overall meaning of a Card or Pebble undermined the very promise that the visual ostensibly affords – ease of understanding. Here, in contrast, the visual

and textual results could be 'so mismatched' that no amount of heuristic reasoning would bring them together.

This is not to say that the participants could not understand why the probes had done so; it was rather that they thought the probes should have done a better job 'even if it's just a trial thingy' as one participant said. This related to the second problem. This had to do with the fact that we had installed a random selection factor in the sorting algorithm. It was this that delivered content to the GUI from the materials scrapped from search list targets on the web and Flickr. It was this algorithm too that sometimes resulted in two elements (visual and textual respectively) that had no close connection being presented alongside one another in a Card or a Pebble. But the same algorithm could irritate the participants when this very randomness generated content whose selection 'could be understood' but which nevertheless 'wasn't relevant'.

This can be put another way. Participants enjoyed a sense of serendipity when Cards and Pebbles presented random yet 'interesting' results within their established semantic frame, yet were discouraged by results that were "too random." One participant, for example, entered the number of a particular camera lens into Pebbles and expected to see information relating to cameras or lenses – and these would include odd cameras that he had not considered, ones brought to bear by Pebbles through 'random' selection. But he was confused when he instead received results about a type of steel that goes by the same number. This information was 'too random' (as he put it) to provoke a sense of serendipity, or indeed of voyaging on the web. He explained that it felt outside the topic he had established while entering his terms.

Other examples were offered by several participants; in such situations they felt lost, as though they had relinquished control of their journey. The lesson from this is that for participants to play and explore, they needed to understand the rules of navigation. And this means, too, that the search processing of the technology should be good enough for this navigation to make sense. Our probe technology did not.

Nevertheless, even as we learnt about these confounding issues, it became clear that the probes had elicited some ideas and aspirations about how to engage with the web on the part of the participants that pointed towards new possibilities. As mentioned, these aspirations turned out to be closely related to the kinds of affordances that participants had come to understand were enabled by the two probes. If search engines create a Newtonian paradigm, our probe method resulted in the probes themselves coming to offer two new paradigms that the participants willingly adopted. The appeal of these was only stepwise though, only a small degree away from what current search engines can do.

Grasping possibilities: Pebbles

Let us explain first of all with regard to Pebbles. As we discussed the problems of randomness with the participants, so it became clear, at the same time, that the probes were illustrating to our participants new experiences that seemed to have a value. Indeed, their reactions served to corroborate the success of exploratory search technologies that we review above. People do want to find what they are *not* looking for. And people do want the experience of this to be of a different order than that offered by Google and Bing. But this has degrees and what is offered can have various forms.

So, with Pebbles, several participants commented that they would appreciate a more structured randomness in which they could easily follow the degrees of abstraction and select whether they wanted 'results' that were broadly or more narrowly focused. As we say, they liked to find what they were not looking for, and they found appealing the experience of being brought things they know nothing about.

But the use of Pebbles made it clear to them that they needed to be more involved in this process. Pebbles made them too passive. Giving them more control over the degree of randomness would make Pebbles appear more interactive and responsive, they explained, and provide them with a sense of a journey that they were partly in control of. It could, also, ensure that they found the trips interesting; so they 'could steer to the good places', as one said.

Even so, the participants also explained that one of the things that perplexed them about the experience that Pebbles was pointing towards was trip-like movement across the web. Yet enjoying a trip was difficult to ensure. Pebbles offered trips, but no quality assurance, to paraphrase. Worse, the design of Pebbles emphasised the participant's own role in the production of these trips, rather than the functioning of the application itself. And the participants explained that they couldn't guarantee a good trip in their choices. Indeed, the presence of random hits on their journey with the Pebbles probe served to remind them that they didn't really know what there was to see. Pebbles taught them that there was likely to be much more fun to be had 'if they had some assistance in the choosing', and yet didn't guarantee delight in the ways it offered assistance, such as through randomness.

There is a subtlety here. Though the participants liked the idea of being able to control the journey once it started, and indeed offered suggestions as to how this might be made possible in an interactive GUI such that they could use the degree of randomness like a rudder, they also pointed out that they needed assistance at the start of a journey – to help them choose what one to make. Pebbles did not help them in this. Instead, it left the production of a journey, or rather the prompt for a journey entirely in the participant's own hands – and as noted, they were out of their depth in this regard. They wanted assistance.

Assistance is perhaps the wrong word, however. Several of the participants explained that they habitually check certain websites for interesting updates, for example. They don't always want to search for information, but sometimes want to be presented with it. What they were alluding to wasn't as simple as, say, a new way of experiencing RSS feeds. What our participants were thinking of were ways of being presented with experiences choices that were 'out of the blue' to them. They explained that the process they had in mind would be similar to their television viewing. As one put it, they would sometimes turn on the TV to 'tune out'. Likewise they would want to tune out on Pebbles – they would want the application to take them away from themselves. They didn't want a feed that reminded them of what they had marked out as somehow important before; they wanted something that enticed them to a topic that they had not thought about before.

How would this work? Many suggested it would be 'fun to use Pebbles' if they were provided with a set of suggestions that would entice them to choose 'this' or 'that' Pebbles journey. One explained, "sometimes I just want to be told something is interesting to go on– you know, come here, follow this. Why can't Pebbles do that?" Some individuals suggested that Pebbles might, for example, provide them with the option to begin a voyage by choosing keywords from a collection of suggested topics (related perhaps to current events). One participant suggested that they would like to switch on their PC, and see a Pebble or a 'couple of Pebbles saying come on this trip, do this. You know like each one an advert for itself.' Various individuals suggested that such Pebbles could be related to times of the day, days of the week, and the identity and preferences of the user. A Pebble array could sit on the right side of a Google or Bing search window for example, and could be updated automatically with new Pebbles as the day passes and new journeys come to appeal.

Of course this begs the question as to how (or by whom) good Pebble trips could be identified before being offered. Some participants suggested that this might be something provided by a web analogue to a travel agent: whereas the latter can lead you around the world in a way that ensures your interest, a 'Pebble advisor would search the web and map out places to go'. Pebble route expertise could become a commodity, it was suggested somewhat flippantly.

Knowing which trip to go on, having a trip selected for you were then one set of issues that came out. Another had to do with a sense of place when on a trip. Many participants felt that the rendering of Pebbles was too static to allow users to fully make sense of trip. Users appreciated that Pebbles displayed their entire journey on a single screen, but felt it became difficult to make sense of that space as their results web grew increasingly large. Several explained they would like to delete Pebbles they didn't find useful, highlight ones they liked, or perhaps even drag certain Pebbles into a free scrapbook space.

With that in mind, several wanted the ability to set up different "boxes of Pebbles" as tokens of their information voyage or even to rearrange the Pebbles into concept maps that represent their own understanding of the results.

By the same token, the participants also noted that a trip should 'end up somewhere'. By this they did not mean that it would end up with the 'right answer' so much as that they felt as if trips always entailed end points, even if the purpose of the trip had been the travel itself. But on closer discussion it turned out that the participants did not mean a particular point so much as that they wanted to be allowed to stop the Pebbling, as it were. They wanted to go on a journey and then discover that they had reached a place they wanted to stop at, to linger within, a harbor in which they landed, if you will. Hence, they would want to easily move from an experience that emphasised travelling across the web, with the associated metaphors of space and distance as presented in the Pebbles interface, to one where they are presented with an overview of a domain, an end point they had reached.

It was not clear however if this meant simply a standard web page or one framed by its Pebble location somehow. Nevertheless, that we had reached a point where these considerations were the ones that our participants wanted to discuss with us is suggestive that the Pebbles probe did indeed point towards new experiences with the web. As should be clear, this experience would not be that different from what current search affords, and would certainly be built upon search technology, but what that experience would satisfy, the motivations that would lead users to it, and the gratifications that would be derived from the act itself, would extend the vocabulary of choice that tools for web engagement - such as search tools - would provide. Doing so appealed to our participants.

Cards, meanwhile, lead our participants to different sorts of reflections, ones more confined to how search may afford more nuanced possibilities, and not to how wholly new experiences might be delivered. It is to Cards that we now turn.

Cards

Cards elicited many fewer remarks than Pebbles. Indeed, the metaphor of cards that people could use web resources to make something, to gather and create, simply did not resonate. As a new tool, a simple and simplifying tool for searching, Cards did seem to resonate, though.

Participants explained that making sense of web results requires effort and can be time consuming, even if they are only browsing the topic. One individual explained that when he uses search engines to find information, "I have the feeling of okay, I've found it, but now what? I just look at it and then I press close and it's gone." Cards presented visually appealing way of presenting and keeping such 'results'.

Beyond this, our participants also remarked that one of the problems with current search experiences is that once you have found a site or some information, it is difficult to know what to do with it. A search engine takes you somewhere and 'sort of dumps you there wondering what to do next'. Cards seemed to embody the thing that is found on a search, and moreover, provides some kind of material that would then be collected and even shared. Some participants urged us to consider linking Cards with 'Facebook and iPhones so that you can just look at it (the card), move it, add to it… drag it to your desktop, mail it to your mate. If it's real quick and easy then people are going to want to do it more."

Other participants also said that Cards had the additional advantage of making something 'where something was not to be found'. By this they meant that they liked the idea that the system would make Cards out of the disparate material that the application found on the web. Several participants remarked that they regularly undertook searches and only found bits and pieces, 'not whole websites' as one put it. With Cards, meanwhile, the system 'sort of made a website for you'. And then the resulting Card could be a resource that people could keep and share – corporeal properties, if you will, that seemed to have especial value.

The appeal of Cards obviously made us think about the Dontcheva paper again. In that, the technology allowed the users to shift their role into one that enabled them to more actively engage with the search specification process – linking between search hits and categories and making rich search possible. Our Cards probe was, in contrast, very simple, offering users very little in terms of altering the balance between the complexity of the search query and the end result. What appealed was the simplicity of that end result and its properties – that it had corporeal properties, for example. Perhaps the appeal of Cards was precisely this simplicity; the appeal of Dontchevas et al's the reverse: the complexity it enabled.

SUMMARY

The interviews made it clear that the probes did succeed in leading the participants to reflect on and consider the ways that they engaged with the web. But the interviews also made it clear that the probes were not entirely successful in dismantling Schraefel's Newtonian paradigm, the one whereby users struggle to see anything beyond search. Many of the ideas that came out related to search related activities.

One reason for this would appear to be related to some of the properties of our two probes. These had to do with the search-based nature of the probes' functioning. The visibility of this in the probes reminded the users of two things. First, that, when it came to search as they understood it, traditional search engines were better than our own probes for certain types of task. Second, it reminded them that the probes were self-evidently about interacting with web content in a search-like way, even though the motivations and the satisfaction that doing so would provide might be of a different order than the users had experienced before. In these respects, our probe method did not lead us to uncover possibilities that were well removed or beyond search. This method was only incremental in this regard.

Nevertheless, the findings were interesting enough to provide us with insights about what new "beyond search" experiences might be – even if these experiences are only a step away from those currently supported. Some of the possibilities highlighted by our participants do seem to be well worth pursuing. Users do seem to find the idea of travelling on the web appealing, and do recognise that this experience will have its own rewards. But as should be clear, designing in a way that satisfies all the essentials that users seem to expect may not be easy – to see at a glance where one has been may be one thing, to stop and linger at a point another; to send a trip to a friend yet another. Pebbles might be a metaphor for some of this, but not all. By the same token, the desire for an application that ensured that web searching produced something, even when there is nothing out on the web that quite fits the search in and of itself, also makes sense. But here a radical simplicity in design seems implied, and this seems related to the apparent simplicity of the user involvement here. They want to reduce the effort they put into search and yet produce more by dint of that very lack of effort.

All of this leads us back to the question of motivation and concepts of the user. In 2003, Taylor & Harper [31] remarked that when people come home after a day's work, they often switch the TV on so as to switch themselves off. TV guides and interaction modes should reflect this – a desire for idleness. Similarly with some aspects of our beyond search findings: some of the things people might want to do can be characterized in terms of motivations, but the term itself is too constricting to capture some motives. People want to be lazy when they search, especially when the absence of 'targets' makes the functioning of search engines implicative of the need for the user to do more – to refine their search, for example, or to engage with the search engine in richer ways. But in fact what users want is for the search engine to somehow make up for the absence of target by 'making one', a Card, in this case. Letting the search engine do the work seems the issue here, a kind of laziness – a motive to be sure but hardly one worthy of the name. People like to amble with their fingers across the digital ether, lingering here and there while looking up with their eyes to see other places they might go to. This is what travelling on the web might entail, a form of ennui. Again, a motive to be sure, but how helpful is that word here? It dignifies an intention in a way that is inappropriate. P.M.S. Hacker comes to mind again: human motivations are as diverse as the tools used to express them, but they also reflect the even greater diversity of human nature. When it comes to inventing and making those tools, anthropology is probably required here as much as any other kind of science

or trade, though an anthropology not of the comparative kind, more philosophical. For beyond search can lead us almost anywhere.

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