

# **ChatterCrop: Reaping the Benefits of Online Product Reviews**

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Web 2.0 has allowed online shoppers to become not just information seekers but also information providers. Many e-commerce venues allow users to share their experiences in the form of textual product reviews. While textual product reviews represent a wealth of information for candidate buyers, finding pertinent information becomes difficult, as the number of reviews for a particular product becomes large, or if the buyer is interested in particular features of an item. We present ChatterCrop, a tool that uses text summarization. ChatterCrop condenses the information from a large set of reviews into a few sentences, and allows users to customize these summaries for feature-focused search. In a user study, subjects used ChatterCrop and a sortable list of reviews, to answer questions about two camcorder models. When looking for information about particular features, ChatterCrop outperformed the list, in terms user confidence and perceived ease in finding pertinent information. ChatterCrop's summaries also provided users with starting points to guide further research, and were particularly helpful in the early stages of sensemaking.

## **Introduction**

Imagine a shopper at a busy market for the first time - she can listen in on conversations and notice which booths are popular and crowded. She may overhear other shoppers discussing a

new seller and notice people pointing and talking about various products. The richness of the environment offers her many cues that support decision making while shopping.

Now consider an online shopper, who lacks access to the above cues. More and more, shoppers are drawn to online shopping by the lower prices (Brynjolfsson & Smith, 2000) and the ease of comparing goods (Lynch & Ariely, 2000). Yet, unlike shopping at one's local store, making purchases online involves interacting with strangers and paying for items yet unseen. Therefore, our potential buyer may view online transactions as being risky (Resnick et al, 1997). She might be unsure as to whether or not the product or service in question meets her needs, whether the company or the individual selling the product is reliable, or if the item will arrive on time and in good condition.

One of the salient features of Web 2.0 is that it enables users to share experiences and create content rather than solely relying on information provided by sellers and manufacturers. Many e-commerce sites utilize customer product reviews to mitigate some of the abovementioned risks. Online customer reviews intend to replicate the buzz or the chatter in a market. Online retailers such as Amazon.com have customer review forums where anyone can share their experience with a product. Similarly, the popular auction site, eBay.com, has a reputation system where buyers and sellers leave publicly viewed feedback of one another after a transaction takes place. In addition, other sites like Epinions.com now exist solely for the purpose of sharing information about almost any product, from electronics to fine wine. Potential buyers can use this chatter while making their purchasing decisions.

Even though online reviews offer a permanent record of customer opinions as compared to the ephemeral chatter and conversations in the real world, they also pose several challenges. One of the challenges is that the number of reviews posted for a particular product can quickly become very large and consequently difficult to use. To contrast, in the offline world, our shopper can easily allocate her attention to conversations in the marketplace that are interesting and pertinent. Another challenge is that not all reviews are helpful to an individual user, who is likely to have particular needs regarding an item of interest.

Popular sites like Amazon and Epinions have tried different approaches to make the customer reviews more useful. Amazon uses a form of social moderation, where users can rate the helpfulness of a review. The reviews can then be sorted chronologically, by the rating, or by helpfulness. Epinions takes a different approach and enforces a certain structure on reviews. A reviewer on Epinions is required to explicitly list the pros and cons of the product. While these approaches help ameliorate the above concerns to some extent, gleaning specific information from a large number of reviews is still problematic.

The current work explores how automatic text summarization can be used to help consumers find information of value to them in a large set of product reviews. ChatterCrop attempts to make online reviews more useful in two ways. Firstly, ChatterCrop summarizes the information

expressed in a set of online product reviews, and presents it in a condensed form ordered by relevance. This helps the shopper get a quick sense of known issues with the product and the general 'chatter' surrounding it. Secondly, ChatterCrop allows shoppers to customize the summaries according to product features that interest them.

## Related Work

Prior research most relevant to ChatterCrop falls into three main categories. First, we investigate the challenges of designing interfaces for online discussions. Second, we briefly describe recommender systems, a class of tools that has been designed to support online shopping, and explain how such systems differ from ChatterCrop. Finally, we will discuss some of the ways that previous researchers have attempted to exploit the information contained in customer reviews.

Online discussion boards enable users with common interests to interact and exchange information easily. However, a major challenge threatening the success of such discussions is that of scale. In any sizable discussion forum, users must read through a large volume of textual messages and attempt to make sense of the conversation (Russell et al, 1993). They may develop strategies for dealing with large amounts of information, such as locally optimal "satisficing" and global "information foraging" (Dix, Howes & Payne, 2003, Pirolli & Card, 1999).

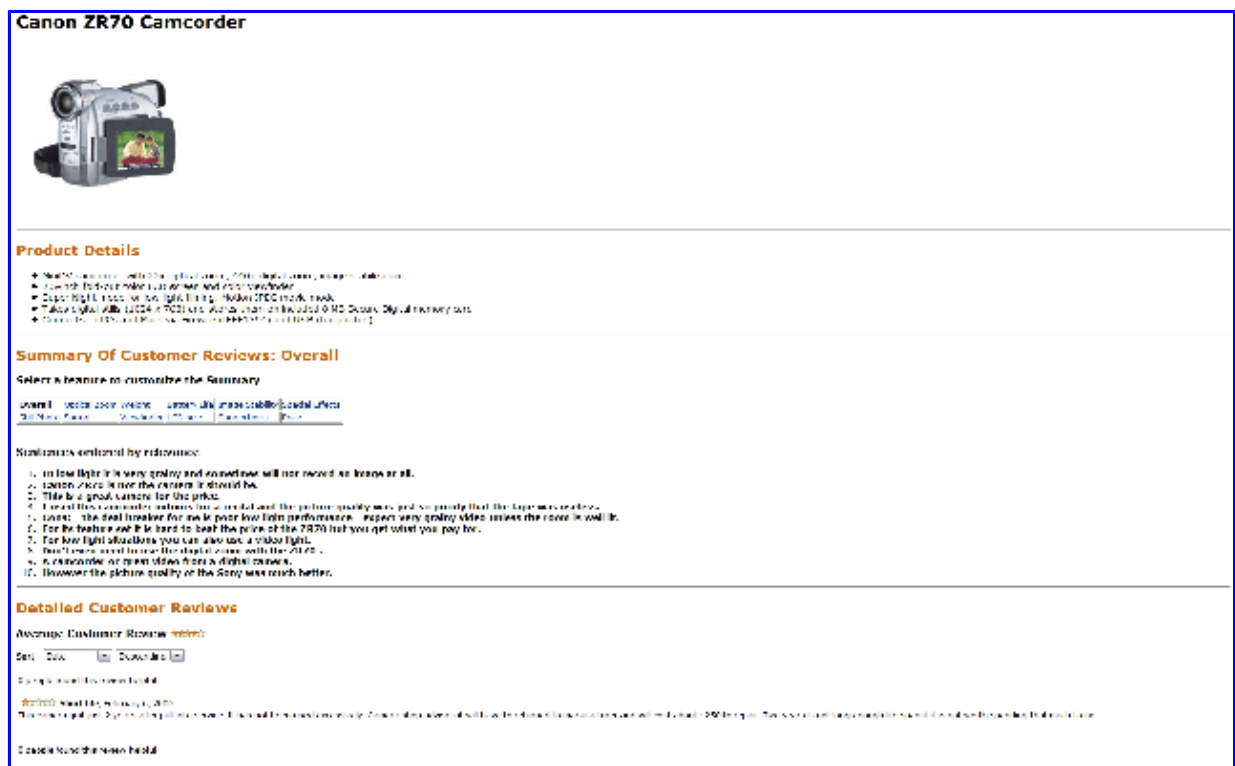
In short, users' interaction in such a "virtual public" space is limited by cognitive load (Jones, Ravid & Rafaeli, 2001). Factors such as the volume of interactions and interactivity will influence how users behave in such a forum. Thus, correctly designing the technologies used in discussion boards is of utmost importance and designers need to keep the above factors in mind. Conversations in discussion groups are structured by topic threads and authorship. These features have been exploited by researchers in designing interfaces that can facilitate users in following the conversations. Examples of such tools are Conversation Map (Sack, 2000), which employs visualization, text analytics and social structure, and Netscan (Smith & Cadiz, 2000) and Grand Central (Miller, Riedl & Konstan, 1997), which both aim to better manage large conversations by representing their threads and authors. In contrast, product review discussions lack salience in structures such as subject threads and authorship.

Recommender systems, in essence, collect information on products from past customers, aggregate it, and present it to new potential customers (Resnick & Varian, 1997). Typically, such systems take as input a matrix describing the features of a set of products, as well as a matrix containing the ratings given to the products by other customers. Given a potential buyer's product preferences, statistical methods are used to find the products that are closest to the candidate buyer's profile, and should be suggested to him or her (Ariely et al, 2004). Such recommender systems operate on numerical representations of product descriptions

whereas in the current work, we attempt to make raw textual information more useful in supporting shoppers' understanding of a given product.

Research in the areas of Information Retrieval and Natural Language Processing has attempted to extract information about products from reviews posted online. For example, previous work has considered the problem of identifying sentiments in various genres of text like identifying positive and negative movie reviews (Pang & Lee, 2004) as well as news articles (Choi, 2005). Of greatest relevance to our work is that of Hu and Liu (2004), who applied text mining techniques to automatically identify the product features that are discussed in an input set of reviews. In addition, they automatically classified each feature as being discussed in a negative or positive manner by reviewers. Their system, Opinion Observer, presented product summaries to users, which for a given product, consisted of listing the features discussed in reviews and the reviewers' respective sentiments (Hu & Liu, 2005). This system differs from ChatterCrop in a number of ways. Rather than attempting to detect which product features are discussed in a positive or negative manner, ChatterCrop allows the user to tell it which features are of interest, and then finds relevant sentences contained in the product reviews. In other words, while ChatterCrop can also produce "generic summaries" of a given set of reviews, it aims to be a customizable system for exploring product reviews as per a particular user's interest.

Figure 1: ChatterCrop interface: reviews and generic summary for the Canon ZR70 camcorder  
Chattercrop: Prototype System



The screenshot displays the ChatterCrop interface for the Canon ZR70 Camcorder. The interface is organized into several sections:

- Canon ZR70 Camcorder:** Features a product image of the camcorder.
- Product Details:** Lists key features such as "Multi-Frame mode with 250 digital frames per second", "Super High Speed Video mode", "Super High Speed Video mode", "Advanced Video iFrame 1024 x 768 resolution", and "Advanced Digital Streaming".
- Summary Of Customer Reviews: Overall:** Includes a section for "Sentences extracted by relevance" with a list of 12 sentences. The sentences discuss the camcorder's performance in low light, its value for the price, and its ability to handle low light situations.
- Detailed Customer Reviews:** Shows an "Average Customer Review" section with a "See" button and a "Download" button. Below this, there is a "Detailed Customer Reviews" section with a "See" button and a "Download" button.

Currently, ChatterCrop (Figure 1) summarizes product reviews collected from the Amazon.com website. It produces generic (or "overall") summaries, which attempt to give the user an idea

of what people are saying in general about a product, as well as feature-focused summaries, which describe what reviewers have said about a particular product feature.

As can be seen, ChatterCrop was designed to be similar to the interface of Amazon.com, which should be familiar to the subjects who participated in our experiment. In order to customize the summary, the user may select one of the features listed in the table. In the current version of ChatterCrop, we have made available summaries relevant to a set of features deemed as being important by camcorders experts<sup>1</sup>. However, in future versions of ChatterCrop, we plan to allow users to input a natural language question about product features of interest.

Figure 2. Generic (overall) summary for Canon ZR70 Camcorder.

**Sentences ordered by relevance**

1. In low light it is very grainy and sometimes will not record an image at all.
2. Canon ZR70 is not the camera it should be.
3. This is a great camera for the price.
4. I used this camcorder indoors for a recital and the picture quality was just so poorly that the tape was useless.
5. Cons - the deal breaker for me is poor low light performance - expect very grainy video unless the room is well lit.
6. For its feature set it is hard to beat the price of the ZR70 but you get what you pay for.
7. For low light situations you can also use a video light.
8. Don't even need to use the digital zoom with the ZR70 .
9. A camcorder or great video from a digital camera.
10. However the picture quality of the Sony was much better.

Figure 3. Feature-focused summary: Connections.

<a href="#">Overall</a>	<a href="#">Optical Zoom</a>	<a href="#">Weight</a>	<a href="#">Battery Life</a>	<a href="#">Image Stability</a>	<a href="#">Special Effects</a>
<a href="#">Still Photo</a>	<a href="#">Sound</a>	<a href="#">Viewfinder</a>	<a href="#">LCD size</a>	<a href="#">Connections</a>	<a href="#">Price</a>

**The following sentences ARE relevant and are ordered by relevance:**

1. Controls and connectivity are very good.
2. Connections: It comes with every possible connector built in so you can dub to/from VCR use USB firewire etc.
3. The owner's manual makes easy work out of digital effects and editing including connections and methods.
4. You do need a firewire cable for direct connection to your Mac/PC however the photos and 10 second movies can be downloaded with the USB .
5. Problem starts with the wiring that connects the CCD it overheats and loosens.
6. Maybe on their next try at it they'll replace/include the IEEE 1394 port with a USB2 connection.

**The following sentences MAY also be relevant:**

1. We are extremely disappointed considering that we have only had the camera for a relatively short period of time have used it sparingly until now and have taken excellent care with it.
2. My kids were playing the halo game on xbox at the time with the surround sound system on loud that is and I still could hear the camcorder motor noise prominently running enough that I couldn't just ignore it.
3. It is absolutely baffling that while you could buy a 500 TV and feel pretty much okay with whatever brand you buy at that price range you just can't erase any suspicion out of your mind when it comes to camcorders and their quality and reliability in today's technological complexity and advancement.
4. This is better than most camcorders out there Sonys typically have 10x zoom.

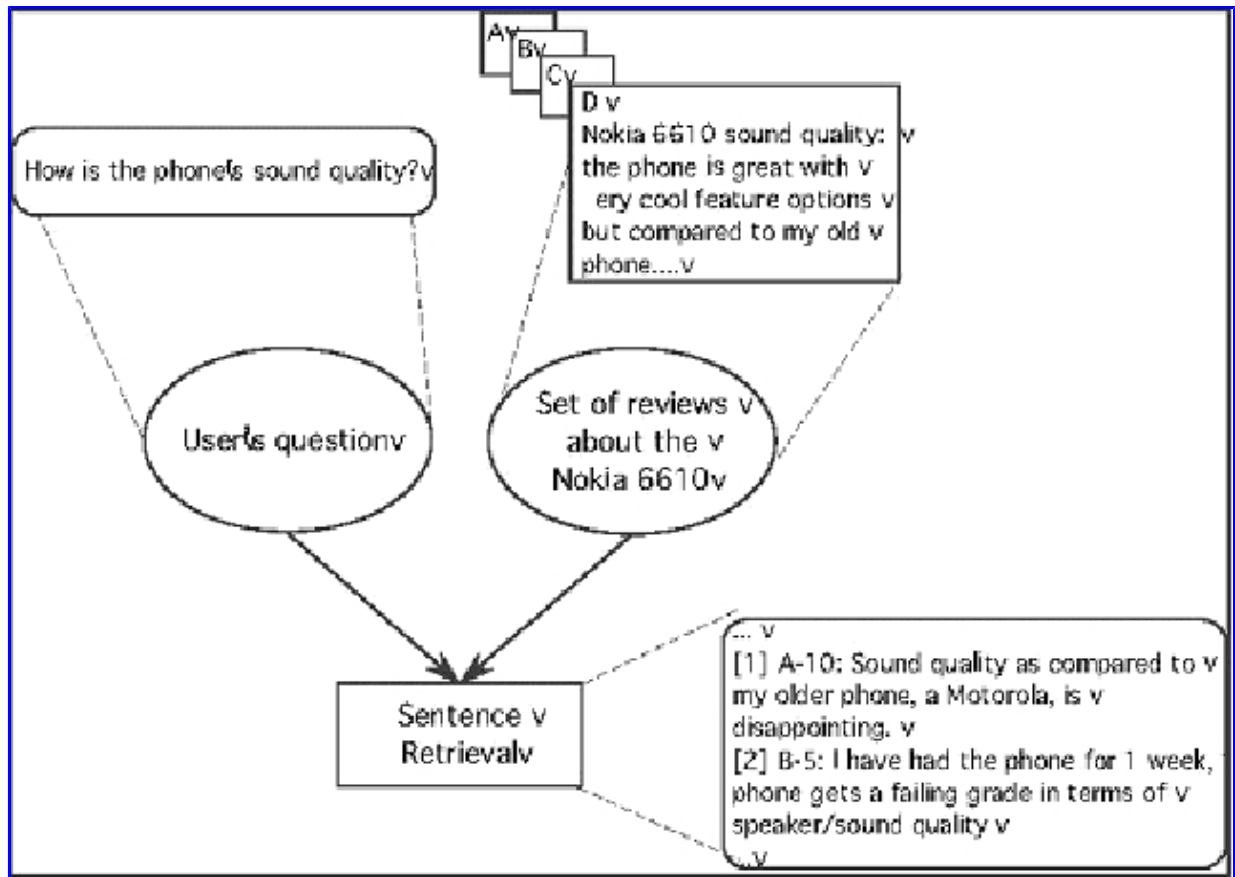
ChatterCrop's generic summaries (Figure 2) attempt to give the user an idea of what people

are saying about a product, by selecting the 10 most representative sentences from the reviews. For a feature-focused summary (Figure 3), ChatterCrop selects the 10 most representative sentences that have to do with the feature “still photo.” The sentences are then grouped into two categories: relevant sentences and sentences that might be relevant. The relevant sentences actually contain the query words “still photo.” Schindler and Bickart (2005) suggest that shoppers look for feature specific “search” attributes as well as more subjective “experience” attributes in product reviews. Chattercrop incorporates both “search” and “experience” attributes. While the search attributes are dealt by the “are relevant” sentences in the feature focused summary, it should be noted that the “overall” reviews and the “maybe relevant” sentences in feature specific reviews are place holders for “experience” attributes.

### **Summarization Approach**

ChatterCrop produces summaries using the sentence extraction approach to summarization, which involves ranking all of the sentences in an input set of texts by their perceived importance, and then choosing the top n sentences (Radev, Hovy & McKeown, 2002). In order to rank the sentences in an input set of product reviews, we use the LexRank graph-based centrality method proposed by Erkan and Radev (2004). While a thorough comparison of summarization algorithms is beyond the scope of the current work, Erkan and Radev showed that LexRank outperforms a number of state-of-the-art approaches on the generic summarization task. Briefly, one key difference between LexRank and more traditional approaches to summarization via sentence extraction is that while the latter typically uses only the properties of individual sentences in ranking them, the former also exploits the similarities and differences between the sentences in an input document to be summarized. In particular, in LexRank, all of the sentences in an input set of texts are represented as nodes in a graph, and the weights on the graph’s edges are a measure of (cosine) similarity between each pair of sentence nodes. LexRank supposes that sentences that represent the general topic of the texts well should be similar to many other sentences. Therefore, LexRank ranks the sentences as to their centrality within the graph. The top 10 ranking sentences are then chosen for inclusion in the ChatterCrop summary.

Figure 4. Sentence Retrieval Procedure



In order to produce feature-focused summaries, we need to identify the set of sentences that discuss a feature of interest to the user. As previously noted, in the current version of ChatterCrop, we use a set of camcorder features created by experts as our queries. Therefore, the goal is to retrieve sentences that are relevant to each query. A common approach to this task is to look for sentences that contain the exact query/feature words (Allan, Wade & Bolivar, 2003). However, this method would miss relevant sentences that do not contain the exact query words (i.e. that are paraphrases of sentences that do contain the exact key words). The method used by ChatterCrop, known as query-sensitive LexRank and described in (Otterbacher, Erkan & Radev, 2005), improves on this by looking for sentences that, while not having any words in common with the user's input question or feature, are similar to sentences that are similar to the question.

## Evaluation

The goal of the current paper is to not only describe the implemented ChatterCrop prototype system, but in particular, to study its usefulness in the context of supporting online shoppers. To this end, we conducted a user study in two stages. In stage one of evaluation, we presented the ChatterCrop prototype to users and got detailed feedback from them. This feedback was used to hone the tool before conducting a larger (24 subjects) user study in stage two. All the subjects were students at the University of Michigan, who used the internet regularly, had

previous experience with online shopping but had never searched for camcorders.

## Study Design

As explained in the earlier section, we used downloaded Amazon user reviews for four camcorders that had comparable features. The ChatterCrop prototype system was used to generate generic (“overall”) and feature-focused summaries for these camcorders. For one of the camcorders, the subjects were presented with ChatterCrop, which also included the list of reviews. For another camcorder they were presented only with the downloaded list of reviews in a format similar to Amazon.com. The remaining two camcorders were used in a tutorial.

The study began with a hands-on tutorial. In the tutorial, the subjects were presented user reviews in both the formats one by one. The features and the interface of each review format were explained to them, and they were given an opportunity to explore these on their own with the help of practice questions. After the tutorial, subjects were presented with camcorder reviews in one format followed by the other. To avoid any bias in the results, we varied the order of camcorders and the review formats (ChatterCrop vs list). For each camcorder the subjects were asked the two questions, and given five minutes to answer each of them.

1. Overall information question. Subjects were asked what the various reviews were saying about the camcorder model.
2. Feature specific question. Subjects were asked what the various reviews were saying about this camcorder model regarding “feature X”.

We used different feature questions on both camcorders presented to a subject for the feature specific question. All subjects answered one question about the feature “battery life”, while 16 of the subjects answered the other question about the feature “optical zoom” and 8 subjects answered the other question about “connections.” For each of the questions the subjects were also asked to indicate their confidence with their answer, and the difficulty experienced in finding the answer on a 5-item Likert scale. At the end of the study, they were given a questionnaire that asked them about their experience and opinion about the two review formats, along with some demographic information.

## Results: Implicit subjective measures

We used implicit subjective measures like perceived difficulty in finding the desired information and confidence in their answer using a 5 item Likert scale. We did a within subject2 analysis of the differences in self-reported confidence and difficulty in answering the questions using the two review formats. Using an equal variances t-test, we found no significant difference between the two formats for the confidence and difficulty in answering



the overall information questions. However, when looking for feature specific information, users were more confident of their answers when using ChatterCrop ( $P=0.0126$ ), and found it easier to locate the information ( $P= 0.0440$ ).

### Results: Explicit feedback

In addition to these implicit measures, we also got explicit feedback from the subjects about things they liked and disliked about ChatterCrop. When asked how often they used the summaries in completing the tasks, all of our subjects reported that they used the summaries at least sometimes, while 63.64% of the subjects reported that they always used the summaries. An overwhelming 90% of the users reported that they read the “may be relevant” sentences, and 60% of the (total) users found them to be useful. Finally 54.5% of the users preferred ChatterCrop over the list of reviews, 31.8% of the users preferred the list of reviews to ChatterCrop, and 13.6% of the users thought both review formats were equally helpful.

### Discussion: User reported usefulness of ChatterCrop

As illustrated in Table 1, the explicit reports of the usefulness were very positive for ChatterCrop. Not only did all users read the summaries when provided, a majority of the users found the addition of summaries to the list of reviews useful.

Table 1. Usefulness of summaries

Question	Percentage of respondents who answered yes
Did you read the summaries?	100%
Did you find the summaries useful?	67%

Yet the implicit reports were only positive for feature focused inquiry. The reports had no difference for “overall” inquiry (i.e. for generic summaries). This could be because lists are simple and familiar. Secondly, some of the users pointed out that the “overall” summaries generated by ChatterCrop were imperfect. In particular there were three problems with the summaries. Firstly the summaries in the “overall” section (i.e. generic summaries) had some irrelevant sentences. Better summarization algorithms in the future may ameliorate some of these problems. Another possible design direction is to use some kind of social moderation in conjunction with summaries. The second reported problem with the summaries was a lack of context. Add on features like brushing and linking can help here. The third problem with the summaries was that subjects were not sure how they were generated which in turn resulted in trust issues. The suggested use of social moderation in addition to summaries may also help with the trust problem.

### Discussion: Feature focus, customization and Sensemaking

While lists were comparable when users were inquiring about the camcorder “overall,” the list format was cumbersome when inquiring about particular features. In contrast to list format, ChatterCrop’s presentation of feature-focused summaries gave users more confidence and made the task of finding relevant feature-specific information easier.

“[ChatterCrop] did the digging for me while I could just click on the features I wanted to read about. It was very easy to look at each feature you're interested in separately, and not to have sift through a bunch of reviews.”

It is worth asking why ChatterCrop performed better on this metric of implicit usefulness when looking for feature-focused information rather than generic or “overall” information. One possible reason may be that when looking for “overall” information, the users have a much wider range of information to choose from and thus can report anything they find. Lists may be sufficient for this purpose. Feature-focused inquiry on the other hand means the relevant information is scattered within the reviews, thus making lists cumbersome.

Another reason why subjects gave ChatterCrop higher approval while looking for feature-focused information was because the summary sentences not only provided them with the required information but also served as starting points for further explorations.

“I liked the brief sentence summaries because they provided a good base of points on different aspects of the product for you to research further within the actual reviews.”

After the first round of user studies, the sentences that were retrieved by ChatterCrop that did not contain the exact feature words were separated from those that had the exact query words, into a “May be relevant” group. We anticipated that this group of sentences would be ignored. Contrary to our expectations, many users not only read these sentences, but also found them helpful. User feedback regarding this group of “May be relevant” sentences reiterates the earlier point about summary sentences being starting points for exploration.

“These [sentences] tended to be relatively poor matches, but I still used them to formulate additional queries.”

Karl Weick’s sensemaking framework (Weick, 1996) offers useful insights into this observation regarding the usefulness of sentences as starting points. Weick says that the central question for a sensemaker is “what’s going on here and what should I look for?” This description is definitely applicable for someone purchasing an unfamiliar product online and stumbling across a list of 40 reviews. In the case of the list format, all the shopper can do is to find the pros and cons of the overall product by looking at the highly and poorly rated reviews respectively. It is here, in the early stages of sensemaking that ChatterCrop can be most effective.

While the relevant sentences provide quick overviews of the features, they also provide starting points like keywords and other features to keep in mind. Even the less relevant (or “may be relevant”) sentences offer rich possibilities for exploration. In other words ChatterCrop does not merely crop the massive text of customer reviews; it provides fodder for further explorations.

## **Next Steps and Future Directions**

ChatterCrop’s performance needs to be measured by an analysis of the quality of the information collected by subjects in the experiment. We are currently analyzing the quality of information collected. We also plan to implement a couple of other improvements. Brushing and linking can be added to ChatterCrop’s interface. Adding a means for social moderation might also improve the users’ acceptance of the summaries. We also plan to allow users to explore the reviews about any product that have been posted to a number of popular sites, including Amazon.com and also Epinions.com. Future versions of ChatterCrop will also allow users to input their own features or questions in the form of a natural language query, it may also be helpful to present users with an automatically generated list of features discussed in the reviews. This might be particularly true in the case of novice users, who do not know what the main features of a given product are.

## **Contribution & Conclusions**

In our user experiment, ChatterCrop was found to be particularly helpful in a shopper’s early stages of sensemaking. The feature-focused summaries guided the users to the specific information without wading through the large mass of texts. Users also got key points that guided further exploration. In addition, our results showed that users were more confident in their answers when using ChatterCrop as compared to the standard list of product reviews

## **Acknowledgments**

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1. In particular, our list of important camcorder features was compiled by a panel of two experts that included a camcorder salesperson as well an experienced user.
2. We also performed a between subjects analysis that confirms the findings of our within subject analysis, but has somewhat lower statistical significance.

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