Web 2.0: Analyzing Knowledge and User Generated Content
How large commercial Web sites design user interaction to enable knowledge-based decision making

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PREFACE

Ever since I was a little kid, I have had a healthy interest in technology, and have been a strong believer that technology can help us to lead more efficient lives. Since starting my five year journey of studying Digital Media at the University of Oslo, I have gained insight into both how the World Wide Web affects individuals, organizations, and society, and how the technology underlying the content enables these changes.

Throughout my studies, my focus has been to create Web based applications that are useful to humans. I have been interested in understanding both the specific parts of an interface, as well as how the small parts work together to create services that are useful and used, and then understanding how these services affect society.

In this thesis, I explore a small part of this larger picture, and attempt to explain how millions of Web users contribute to create value for themselves and each other alike. During my work on this project, I have encountered a range of different aspects, and I could surely have spent countless days exploring them all. As it turns out, however, time is a limited resource, and prioritizations have been required. I would like to thank my advisor, Jo Herstad, for keeping an open mind and allowing me to iteratively narrow my focus. With so much to study, I think it has been invaluable to be able to drift between aspects before settling on a more defined area.

I would also like to thank the MOSCITO group in general, and specifically the local group at the University of Oslo. Working within this group has provided much useful input, and has allowed me to experience different perspectives. Finally, I would like thank everyone that I have spoken with about the topic of my thesis. Although I may have been less than 100% clear and explicit in the explanation of my work, your input has helped me arrive at the final product.

I hope this thesis will help you understand what’s been going on in my head the last few years!

Gunnar Lium

Oslo, May 1, 2008
ABSTRACT
I have studied how user generated content and interaction design work together on large commercial Web sites to enable users to acquire knowledge from large bodies of information, and to make informed decisions based on this knowledge. The study combines perspectives from media studies, human-computer interaction and knowledge management to understand the complexities of the modern Web.

Through a combination of exploration and analysis of Amazon, Booking.com and LinkedIn, I have seen how different kinds of information require different approaches to decision making, and how reputation management can help both creation and retrieval of high quality content.
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1 INTRODUCTION

Ever since the World Wide Web saw the light of day in April 1993, it has enabled sharing of information in ways never before imagined. Throughout these years, the amount of information has been growing rapidly, parallel with the Web’s manifestation as perhaps the most essential technology of modern society.

The Web is now a platform enabling many kinds of services, from pure entertainment to high profile business. We have seen shifts in the underlying power structures of society, in part because of the increased availability of information, and in part because of the rise of citizen journalism. More and more people are both producing and consuming information, simultaneously increasing supply and demand.

The immediacy of the medium allows current events to be discussed while they are happening. Firsthand witnesses can publish information about occurring natural disasters, and bloggers all over the world can discuss the latest trends in Web development. People can comment on other peoples’ publications, creating a constant supply of information.

The Web is a largely uncensored environment, where virtually anyone can publish anything, no matter whether their government likes it or not, or whether it is true or not. Independent voices can provide a different tale than the authorities would prefer.

The combination of global reach, instant publishing and unedited citizen journalism means that we have more sources of information than ever before. But with more sources and less control, how can we find reliable information about the topics we want to explore? When professionals and laymen publish material side by side, how do we know what to believe? Will all the available material constitute an information overload, where we spend all our time navigating, reading, evaluating, and communicating a steady flow of information, rather than acting and getting our job done? Or are we witnessing a radically more efficient information environment unfold, where online reputation can substitute the established sources of information?

1.1 THE “NEW” WEB: WEB 2.0 AND USER GENERATED CONTENT

A common name for current developments of the Web is Web 2.0. Developers are used to using versioning numbers for software, and the term Web 2.0 hints at a new kind of Web. What is new? One fundamental aspect and the focus of my study is user generated content. This is a departure from the established publisher-reader relationship of traditional media. The two main implications of content produced by readers, is that there are many more
readers than traditional publishers, and that most readers lack the editing and quality assurance of traditional publishers.

More content usually means more information and having access to more information means that you can make more informed decisions. The problem, however, is that having access to almost six thousand user generated reviews of a Harry Potter book can be quite overwhelming. You might just as well read the book and make up your own opinion. So the question is how Web sites can make the opinions of thousands of readers manageable. How do readers decide what reviews to read and trust? How can we make sure all those reviews are relevant and of good quality?

1.2 Why Is This Topic Important?

When the amount of available information grows, it is even more important to be able to assess the validity of sources. This problem is relevant both within a single Web site, and across the Web as a whole.

A friend of mine told me how his grandfather was completely dumbfounded that there was no responsible editor for the Web. For hundreds of years, it has been assumed that written words can be trusted. Although the mass media has both scrutinized and been scrutinized, the fact that the publishers of information can be held responsible for errors has also meant that publishers do their best to provide accurate information. Errors are more often related to different opinions and perspectives or incomplete sources, than intentional falsification. On the Web it becomes more important to both assess whether a source can be trusted and whether the information it provides is relevant.

Digitalized information made available through the Web holds the promise of increased productivity in organizations and an easier life for common people. During my time at the University of Oslo, however, I have been faced with courses and readings explaining how hard it is to create truly useable systems. Poor interfaces, poor planning, and poor implementation has led to high costs and limited value for users.

The paradox seems to be that while academia is very problem oriented, the Web itself defies those problematic assumptions and proves itself to be highly usable. What are the most successful Web sites doing right? What can we learn from them?

My study identifies important aspects that can help producers create useful Web sites with high quality content and help consumers understand some of the principles behind the technology they use every day.

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1 http://www.amazon.com/review/product/0439358078/
1.3 **My Research Questions**

I have identified two main questions:

- How can reputation management encourage contributors to provide high quality content and help visitors assess that quality?

- How can Web site developers help users to find information they can apply for knowledge based decision making?

To find answers to these questions, I have drawn on theories from media studies, knowledge management, and human-computer interaction in order to study three parts of the problem: the medium, the content, and the interaction.

I have examined three large commercial Web sites, which by virtue of their success, are expected to do “something right”. The Web sites are Amazon\(^2\), Booking.com\(^3\), and LinkedIn\(^4\), all three established contenders within their respective domains.

I have focused on how high level application design and user interaction design work together to enable visitors to find information that help them achieve their goals. The assumption is that content and interaction is interdependent; one cannot be successful without the other. The common term “garbage in, garbage out” comes to mind, meaning that no matter how well designed an interface is, it will be useless if the information it deals with is useless. Top quality content will be similarly useless if it is not accessible.

While studying the sites, I have applied a combination of exploration, framework-based analysis, and goal-oriented scenarios. Using an iterative process, I have identified potential issues, and examined how those issues are dealt with.

1.4 **The MOSCITO Project**

My research is done in relation to the MOSCITO project. MOSCITO is an abbreviation for "Mobilizing Social Capital in Global ICT-based Organizations", and is a collaborative work between Telenor, The University of Oslo, NTNU and Statoil, as well as various partners from universities abroad. The project is in part funded by the Norwegian Research Council. Our purpose is described as such:

"The MOSCITO project will generate new empirical insights and accumulate evidence in the form of practical organizational knowledge as to how organizations operating on an international scene can use specific communication technologies to

\(^2\) http://www.amazon.com
\(^3\) http://www.booking.com
\(^4\) http://www.linkedin.com
develop, maintain, combine and exploit social capital. The project will focus on three central types of technological clusters: mobile applications, web-based applications and e-mails & messaging, and investigate how each of these clusters affects the deployment of social capital in organizations.”

I have worked with the MOSCITO project in a previous course, where my group focused on the use of technology for collaborative work (Chaibi, Holøien and Lium 2007). During this course, I was introduced to the aims of the MOSCITO project, and gained valuable insight into how the group organized their work. At the same time, I gained useful insight into the somewhat intangible term social capital, as well as firsthand experience with Web based tools for sharing and creating information, and how these tools can both enable and complicate processes.

My current study examines how Web applications can encourage high quality contributions, where social capital can be an aspect of this process. Social capital is a widely applied term with many definitions, often related to the value of having positive social relationships. I will not spend much time on social capital, apart from acknowledging that it can be relevant in the context of reputation and user generated content.

What I hope my study will contribute to the MOSCITO project is insight into many of the mechanisms enabling sites integrating user generated content to flourish, which may also be applied in the more confined case of social capital in organizations.

1.5 HOW THIS THESIS IS ORGANIZED

Understanding how Web sites generate and manage knowledge to provide valuable user experiences requires an understanding of the medium, the content, and the interaction. In Chapter 2 I explore these three aspects, drawing on theory from media studies, knowledge management, and human-computer interaction.

In Chapter 3 I discuss my methodological decisions, introduce the methods and techniques I have employed, and explain how I have performed my study. In Chapter 4 I introduce the three cases, and explain why I chose them, and the scenarios I developed for each case.

In Chapter 5 I present my findings, which are discussed in Chapter 6.

In Chapters 7 I wrap up the thesis with a conclusion and some ideas for further studies.
2 Theoretical Framework

My study is performed within a Master’s Degree program in digital media. This program is newly established, and seeks to apply a multidisciplinary approach to understanding new media. During the last few years, this group has studied the design, development, and use of digital media, aiming to apply several perspectives to better understand the implications of the digitalization of the media. Although closely related to the more general fields of media studies and informatics, digital media tries to position itself somewhere in between.

Within this multidisciplinary context, I will consider three related aspects:

- Internet and the World Wide Web as a medium
- Information and knowledge as the content or message of that medium
- Human-computer interaction as the link between the medium, the message and the user

To understand the medium, we need to look at its history, beginning with the early visions the memex by Vannevar Bush (Bush 1945), through to the release of the World Wide Web in 1993 (Naughton 1999). To understand the impact of the new medium, we can apply the theories provided by Marshall McLuhan and Raymond Williams (Lister, et al. 2003) to understand the implications of remediation and convergence (Bolter and Grusin 2000). This will be the topic of subchapter 2.1.

Information and knowledge are terms discussed within a plethora of disciplines. I will draw on theories from the field of knowledge management (Alavi and Leidner 2001). This will be the topic of subchapter 2.2.

Finally, I will explore how usability (Nielsen 1999) (Krug 2000) and information architecture (Morville and Rosenfeld 2006) affects the human-computer interaction (ACM SIGCHI 1992). This will be the topic of subchapter 2.3.

2.1 On the Medium – The World Wide Web

The World Wide Web, in this thesis usually referred to as simply “the Web”, has altered the everyday lives of people all over the world. A few simple principles have allowed this relatively young technology to have a tremendous impact. I will briefly examine the history of the Web, explore its current state, and introduce a few theories for understanding its impact. As we will see, the idea of the Web as an information environment where the distinction between producers and consumer is often blurry is not new.
2.1.1 The Origins of the World Wide Web

No discussion of the Web is complete without mentioning Vannevar Bush’s seminal article *As We May Think*, where he introduces many of the concepts that we now take for granted. In the post World War II era, he saw a growing mountain of research threatening to destroy scientific progress. As he wrote: “the investigator is staggered by the findings and conclusions of thousands of other workers – conclusions which he cannot find time to grasp, much less remember, as they appear” (Bush 1945).

Long before the rise of the Web, there was as an identified problem of information overload. Rather than being bogged down, however, Bush saw opportunities in emerging technologies like the photocell and cathode ray tubes, and let it inspire him to conceptualize the memex, a memory extender based on microfilm. The memex would let its user store thousands of documents and create links between them. His article discusses the imagined possibilities of technology for aiding humans to perform all kinds of tasks, although his main focus is to enable storing, organization and retrieval of data inspired by the way humans think.

Fast forward to the early 1990’s, when, inspired by Ted Nelson’s ideas of hypertext (Nelson 1974) and enabled by development of ARPANET and later the Internet (Naughton 1999), Tim Berners-Lee published his *Information Management: A Proposal* (Berners-Lee 2000). Similar to Bush, Berners-Lee saw a mounting problem with managing information. The solution he saw was to employ hypertext. Hypertext was defined as “human-readable information linked to together in an unconstrained way” (Berners-Lee 2000). Utilizing a client-server architecture, all users could access the same system. His vision for the Web was an information environment where everyone was both publishers and readers at the same time.

In 1991 the first version of the Web was unleashed, with Hypertext Markup Language (HTML) as the document format and the Hypertext Transfer Protocol (HTTP) for delivery. Vannevar Bush’s vision of an interlinked information repository was finally realized, albeit in a somewhat modified state.

The first content on the Web was static text files with static links to other such text files (Jazayeri 2007). Although more powerful than any previous system for organizing information, software engineers soon found that the client-server architecture of the Web allowed for more complex operations on the server. Documents could be generated dynamically, retrieving information from a database to present updated information. It was now easy to create a few templates, and then populate them with dynamic information, greatly expanding the amount of information that could be made available. In addition, this programmatic approach also allowed Web users to send information back to the server, and thus introduce interactivity.
Recent years have seen a development towards a new kind of Web applications, often referred to as Web 2.0. The 2.0-part suggests that this is a new version of the underlying software. Although there has certainly been development in the software foundations of the Web, the versioning number refers more to the content or philosophy dominating the pioneers within each era. Conforming to the tradition of software development, where numbering starts at zero, we could say that the initial static Web was version 0.0 or 0.1, and that the dynamic Web was version 1.0.

The content dominating version 0.0/0.1 was mostly scientific papers and corporate Web sites imitating paper brochures. Most content on the Web was also available offline, and it had few properties not available in their analog counterparts (the exception being the links between content).

The dynamic properties of Web 1.0 allowed more complex Web sites, and set the field for large corporate sites and e-commerce. During this phase (which is still very active), the Web was dominated by the publisher-reader relationship of traditional media. Readers or users were consuming the products and services produced by the publishers. Although these services could be complex, and certainly not always easily replicated offline, they were nothing compared to the changes we have seen the last few years, which have been coined Web 2.0 by O’Reilly Media founder Tim O’Reilly (O’Reilly 2005).

### 2.1.2 Web 2.0 – The Concepts of the “New” Web

The term Web 2.0 has established itself as perhaps the most used (and misused) buzzword of recent discussions and marketing of the Web. O’Reilly provides a good and thorough explanation in his paper where he identifies seven important aspects of Web sites considered to be Web 2.0 (O’Reilly 2005):

1. Services, not packaged software, with cost-effective scalability
2. Control over unique, hard-to-recreate data sources that get richer as more people use them
3. Trusting users as co-developers
4. Harnessing collective intelligence
5. Leveraging the long tail through customer self-service
6. Software above the level of a single device
7. Lightweight user interfaces, development models, AND business models

A recurring topic is that of users creating value. Where pre-Web 2.0 sites only relied on users as consumers, Web 2.0 sites also rely on users as producers. In combination with more flexible data interaction, rich user interfaces, Web services and device independence, this
allowed for the rise of a whole new kind of Web sites. To central topics that will receive further attention are interaction and users as producers.

2.1.2.1 Data and User Interaction

O’Reilly’s definition of Web 2.0 is very much based around data and data interaction. This includes how data is interchanged between both applications and users, how data is displayed and interacted with, and where data is available. At the heart lies a focus on separating data and presentation. The same data should be available for different applications; that being different Web sites, desktop applications, mobile devices, or any other imaginable setting. The data should be available regardless of the programming language or technology of choice.

On the Web, we see the effects of this separation through richer user interfaces and sites that incorporate data from several sources to provide added value for users. For Web applications, the accepted term for these new interfaces is Ajax. Ajax was first coined by Jesse James Garrett of Adaptive Path (Garrett 2005):

“Ajax isn’t a technology. It’s really several technologies, each flourishing in its own right, coming together in powerful new ways. Ajax incorporates:

- standards-based presentation using XHTML and CSS;
- dynamic display and interaction using the Document Object Model;
- data interchange and manipulation using XML and XSLT;
- asynchronous data retrieval using XMLHttpRequest;
- and JavaScript binding everything together”

Although none of the components of Ajax are new, their application is certainly novel. Ajax allows more responsive user interfaces, drag and drop functionality and animations. The old paradigm of Web browsing equaling separate pages, where the entire page has to be reloaded to update the content, is challenged by new applications where it is possible to update only parts of the page, resulting in faster response times, and thus better support for creating services which are less page bound.

2.1.2.2 Users as Data Producers and Consumers

Another aspect of Web 2.0 is the creator of content. Traditional Web sites have been dominated by one way communication, with a publisher and a reader. What is displayed on a Website is what the owners want to display. When visiting the site, you get the impression that you are the only current visitor. Many modern Web sites move away from this paradigm,
and implement features allowing the users to be an active part. The degree to which the users are the service, as opposed to only contributing to it, varies.

Some sites, like MySpace\(^5\), Wikipedia\(^6\), and Digg\(^7\), are completely dependent on user generated content. MySpace is a community, where the heart of the service is each user’s personal “Space”, where they can post pictures, stories, and other content and connect with friends. Wikipedia is an on-line encyclopedia 100% generated by volunteers from all over the world. Digg is place for discovering and sharing content on the Web; users post links to Web sites, and vote for links they like. Without user contributions, these sites would simply be empty. If no one bothered writing articles on Wikipedia, the site would be completely useless.

Other sites, like New York Times\(^8\), Yelp\(^9\), and Ma.Gnolia\(^10\), integrate user generated content into established services. New York Times, like many other on-line newspapers, allows users to comment articles. Yelp is a city guide combining a traditional Yellow Pages service with user contributed reviews of the places. Ma.Gnolia is a bookmarking service, allowing users to store their favorite bookmarks on-line, while at the same allowing users to rate, tag, and comment their bookmarks, share them with friends and search for bookmarks tagged by other users. These sites could very well exist without published user generated content, but user contributions make the services more valuable.

2.1.3 UNDERSTANDING THE WORLD WIDE WEB

Two main paradigms underlie current studies of new media, where the Web has recently taken a central position. These two paradigms differ greatly in their view of the power a media technology has to transform a culture (Lister, et al. 2003). In one camp, we have the provocative technological determinist Marshal McLuhan, who claims that the nature of a medium shapes its users and their culture, and that the medium itself is more important than the content. In the other camp, we have Raymond Williams, who defies McLuhan’s claim that “new media change everything” and argues that new media technology only serves to further the already present social processes and structures.

It is not my intention to assert that any view is more correct than the other, but rather to take the approach of Bolter and Grusin, and accept “social forces and technological forms as two aspects of the same phenomenon: to explore digital technologies themselves as hybrids of technical, material, social and economic facets” (Bolter and Grusin 2000).

\(^{5}\) http://www.myspace.com  
\(^{6}\) http://en.wikipedia.org  
\(^{7}\) http://digg.com  
\(^{8}\) http://www.nytimes.com  
\(^{9}\) http://www.yelp.com  
\(^{10}\) http://ma.gnolia.com
I will first discuss McLuhan’s aphorisms “the global village” and “the medium is the message”, and consider his perception of technology as an “extension of man”. I will then explore Williams’ view of social shaping of technology, before finally discuss the more pragmatic approach taken by Bolter and Grusin, and the theories of remediation, immediacy and hypermediacy they propose.

2.1.3.1 McLuhan, “Global Villages” and “The Medium is the Message”

McLuhan outlines four sequential media cultures that humans have gone through (Lister, et al. 2003). He begins with the “primitive” oral/aural culture, where there was a dominance of aural communication and where the sense of hearing was central. This was followed by the more developed culture of literacy, where written words supplemented oral communication. During this phase, there was a good balance between the ears and the eyes, and there was little difference between the effect of oral and written communication, written words were most often read aloud to the audiences. The following phase was the print culture, which was completely dominated by the eye. Mass produced information were distributed across great distances and simply read, not read aloud. With the raise of radio, television and eventually the computer, the electronic culture regained the sensory grace of the pre-print culture with a new focus on both hearing and sight. This new culture is more connected, more simultaneous, and more collectively involved, a sort of tribal-like “global village”.

According to McLuhan, there is no distinction between a medium and a technology, and he argues that media is simply an extension of the human body and sensorium; the wheel is an extension of the foot and a book is an extension of the eye. If we accept this assertion, then we can also agree that the medium does change society. The wheel has allowed for radical changes in our perception of travel and distance. The current status of such extensions of the body affects society; when we have cars, we can travel great distances, and when we have telephones, we no longer need to travel great distances.

Linking this to the perception that “the medium is the message”, we can see that it is more important to consider how a medium affects society, than the content of message. The same message can be transmitted using a letter sent with the mail, by a person driving a car, or by telephone. What’s interesting is study is the properties of the different media, which differ greatly.

Lister et al. highlights an interesting point from McLuhan’s Understanding Media: that the power of media owners is not related to the content, so much as to the medium itself. He rather claims that focusing on “what the public wants” is merely a disguise, and that users of a medium are more dependent on the medium itself. This notion could serve to justify the large amounts of soap opera and reality shows currently airing; it is not human’s appreciation
of the content that warrants the programs, but rather the fact that we enjoy watching television.

2.1.3.2 Williams and Social Determinism

McLuhan’s strongest critic is the British Marxist Raymond Williams. He denies the notion of technological determinism, arguing that media only furthers the already present social processes. According to Williams, “all technologies have been developed and improved to help with known human practices or with foreseen and desired practices”, cited in (Lister, et al. 2003). Williams argue that technology cannot be separated from its use and content, and that it is developed based on human intention and agency. Whereas McLuhan argues that technology determines the evolution of society, Williams view is that the goals of specific social groups determines the “pace and scale” of technological development (Lister, et al. 2003).

Both theorists are likely to acknowledge that technology will often be used in a different way than originally intended. Williams argues that the final use of a technology is subject to the continuous evolution of human and social needs, causing modifications and adaptations of both the technology and the use. There are several possible outcomes and only social aspects determine the actual outcome (Lister, et al. 2003). McLuhan, on the other hand, would argue that the final use of a technology is predetermined by the technology itself.

2.1.3.3 Remediation and Convergence

McLuhan’s remark that “the ‘content’ of any medium is always another medium [; the] content of writing is speech, just as the written word is the content of print, and print is the content of the telegraph”, cited in (Bolter and Grusin 2000), sets the background for Bolter and Grusin’s discussion of remediation. While being cautious of embracing McLuhan’s deterministic views, they consider his analysis of media’s remediating powers to be very relevant.

Recognizing that many Hollywood producers in the mid 1990’s made movies based on classic novels, they argue that this kind of borrowing from other media has been very popular throughout history. In their book, they explain how paintings can remediate both biblical stories and modern photography, showing that the same content can exist across various media.

Bolter and Grusin introduce the terms immediacy and hypermediacy as two different strategies to understanding and implementing media. Immediacy attempts to transparently mediate something, meaning that the medium itself tries to get out of the way as much as possible. Immediacy can be seen in illusionist paintings, where the artist tries to trick the
viewer into believing that a painting is real (Little 2004), and in photography and virtual reality. Hypermediacy does the opposite, highlighting a fascination with the medium itself. Both impressionist paintings and the modern computer desktop and Web browsers are examples of hypermediacy. They rely on the properties of the medium to enhance their message. In combination with McLuhan’s theories of the medium as the message, these two strategies form the foundation of remediation.

The Web holds the promise of being able to remediate all previous media. Literature, newspapers, television, movies, music and virtual reality are all forms of media that the Web incorporates and remediates. The flexibility of the Web allows different media to be mediated through a single medium. This process is often referred to as *convergence*, based on the Latin terms *con verger* which means “run together” or “come closer”. When different media are available through the same medium, they are said to converge. Convergence is a broad term, however, and even within the limited field of media studies, it covers three different aspects (Lister, et al. 2003):

1. At the level of *production*, newspapers, music, and television once had very different physical production bases, but can now be produced using the same networked multimedia computer.
2. At the level of *distribution*, all kinds of media can now be mediated digitally over the Internet.
3. At the level of *media ownership*, companies working in previously different sectors now merge to become all encompassing corporations.

A relevant implication of convergence is where and how we find information. Since we can pretty much find everything online, and also very much of it by visiting just a handful of sites, we risk losing the diversity of the analog world in exchange for a centralized information source. However, since the Web also enables millions of new publishers, the diversity is most likely increased.

### 2.2 On the Content – Knowledge and Data Quality

Knowledge is a term which can relate to several concepts, and is often used without further explanation. What we mean by knowledge can often be derived from the context in which the term is used, but to be useful for research purposes, further explorations are required. Discussions about what knowledge is date back to the Greek philosophers, and have been the source of much epistemological debate (Alavi and Leidner 2001). As Alavi and Leidner argue, however, for application in knowledge management theories, it is not necessary to engage further in this debate. Rather, I will focus on contemporary definitions.
I will begin by introducing the hierarchical view of data, information, knowledge and wisdom, and explore its origin (Sharma 2008), dimensions (Ahsan and Shah 2006), and a reverse perspective (Tuomi 1999). I will then explore the concept of tacit and explicit knowledge (Tuomi 1999). This will be followed by a presentation of data quality (Strong, Lee and Wang 1997) and user generated content (OECD 2007), before I finish with a discussion of decision making (Simon 1979) (Norman 2004) and reputation management (Resnick, et al. 2000).

2.2.1 DEFINING RELATIONSHIPS: KNOWLEDGE AND INFORMATION

Knowledge is often defined in relation to the terms *data* and *information*, and sometimes also *wisdom* and *understanding*. No final definition has been established, even though the terms have existed for a long time (Ahsan and Shah 2006). The differentiation is important however, especially when considering information systems. As Sveiby (Sveiby 1997), referenced in Ahsan & Shah, states:

“The widespread [...] assumption that information is equivalent to knowledge and that the relationship between a computer and information is equivalent to the relationship between a human brain and human knowledge can lead to dangerous and costly mistakes”.

The argument is that the human brain cannot be directly modeled by computers. Information stored by computers is not the same as knowledge stored in humans, and computer systems dealing with information and knowledge need to take this into account.

A concept known as the DIKW hierarchy is often referred to, and Ahsan and Shah provide the following definitions:

- **Data** – factual information used as a basis for reasoning, discussion, or calculation
- **Information** – knowledge obtained from investigation, study, or instruction
- **Knowledge** – the range of one’s information
- **Wisdom** – accumulated philosophic or scientific learning

The exact origin of these terms is still not quite clear (Sharma 2008), ranging from a poem by T. S. Eliot from 1934 through lyrics by Frank Zappa in 1979, to the fields of information science and knowledge management in the late 1980’s. Sharma cites Russell Ackoff as the initiator of the DKIW hierarchy, although Ackoff also added an intermediary level of *understanding* between knowledge and wisdom.

According to Ahsan and Shah (Ahsan and Shah 2006), Ackoff says that understanding is related to learning, as opposed to knowledge, which is memorized. Knowledge is merely a collection of information stored in a person’s brain, although in a manner that makes sense to
the person. This exemplifies a clear distinction between information and knowledge, in that the knowledge is tied to the person “having” it, while information exists outside and independent of the person.

Ackoff’s definition of understanding is knowledge synthesized in the human brain to create more knowledge. Understanding allows us to see relationships between knowledge, and draw conclusions based on these relationships. This might imply that understanding is more like a process, than an actual level in the DIKW hierarchy. Bellinger et al. suggest that understanding is an integral part of moving from one level of the hierarchy to the next, meaning that we move towards and increased level of understanding (Bellinger, Castro and Mills 2004). In this model, understanding is not just tied to knowledge, but to all levels of the hierarchy.

Alavi and Leidner’s review limits the hierarchy to only include three dimensions, stating that “data is raw numbers and facts, information is processed data and knowledge is authenticated information” (Alavi and Leidner 2001). They go on to argue that the hierarchy is not really robust, and that we should focus more on the minds of individuals. As they write, “knowledge is information possessed in the mind of individuals: it is personalized information (which may or may not be new, unique, useful, or accurate) related to facts, procedures, concepts, interpretations, ideas, observations, and judgments” (Alavi and Leidner 2001). I find this definition to be more practically applicable, and especially the view that information is something external, while knowledge is intrinsically tied to humans.

Ilkka Tuomi supports this argument, while also arguing for a reversed knowledge hierarchy (Tuomi 1999). He states that “knowledge exists which, when articulated, verbalized, and structured, becomes information which, when assigned a fixed representation and standard interpretation, becomes data”. His argument is that without humans to provide meaning, information cannot exist, and data can also not exist unless humans have found a way to disseminate information further.

This follows up the notion that knowledge is something which is dependent on the human mind, and that cannot otherwise exist. “Information is converted to knowledge once it is processed in the mind of individuals and knowledge becomes information once it is articulated and presented in the form of text, graphics, words, or other symbolic forms” (Alavi and Leidner 2001).

I find this view to be inspiring, but would propose to consider a circular, rather than hierarchical, view. While I can agree that knowledge exists before information, I also believe that information can result in knowledge, and that it is the continuous process between
information and knowledge which is most relevant to study (Figure 2-1). In fact, Tuomi has also addressed this topic, discussing tacit and explicit knowledge.

![Figure 2-1: The circularity of knowledge and information](image)

### 2.2.1.1 Tacit and Explicit Knowledge

According to Tuomi (Tuomi 1999), Michael Polanyi made a distinction between *tacit* and *explicit* knowledge. He argued that “we can know more than we can tell”, meaning that knowing is a combination of focal and subsidiary components of meaning. Tuomi interprets this as “subsidiary knowledge consists of subliminal and contextual cues, which we cannot be aware of as such”. The context that surrounds that which is explicit is called tacit knowledge, and, as Polanyi argued, is required in order to understand the explicit.

Nonaka, based on Polanyi, have developed this further. He argues that “tacit knowledge has a personal quality, which makes it hard to formalize and communicate”, while “explicit or codified knowledge refers to knowledge that is transmittable in formal, systematic language” (Nonaka 1994). In his view, tacit knowledge can indeed be transmitted or transformed, and thus become explicit. He considers explicit knowledge to be information that has been *externalized* from tacit knowledge, while tacit knowledge is explicit information that has been *internalized*. Nonaka has identified four modes of knowledge creation, also including *socialization* (where tacit knowledge is transmitted as tacit knowledge) and *combination* (where several sources of explicit knowledge are combined). The model is often referred to as the SECI-model.

This view is distinctly different than Polanyi’s, since Polanyi would argue that tacit knowledge is always tacit, and only exists as a precondition for explicit knowledge. I think both views of tacit knowledge are relevant, but I would argue that a more complete model should include implicit knowledge as well. Whereas tacit knowledge is something personal that is difficult to explain, implicit knowledge is simply knowledge that is not articulated. Often, the explicit
information will be sparse, because it is assumed that those consuming that information will already possess the required information for proper interpretation, i.e. implicit knowledge.

My interpretation of Nonaka’s model is that he does not consider implicit knowledge, but rather uses the term tacit to cover both tacit and implicit knowledge. I do, however, agree that for many practical applications, this distinction is not important. It can be valid to simplify both the knowledge hierarchy and the tacit/explicit distinction, and just consider information as external to the human mind, and knowledge to be internal to the human mind. By being aware of both Polanyi and Nonaka’s views of tacitness, and Nonaka’s SECI-model, I think we have solid base for understanding the relationships and implications of knowledge and information.

2.2.2 DATA QUALITY

Having defined information and knowledge, we can dig deeper into information as a part of information systems. Strong et al. (Strong, Lee and Wang 1997) have studied the issue of data quality (DQ), as related to databases in organizational information systems. They argue that DQ is usually treated as an intrinsic concept, independent of the context in which the data is produced and consumed. This has the implication of ignoring the context in which data is applied. It is common for the same data sources to be applied in various situations with differing requirements.

Strong et al. define high quality data as “data that is fit for use by data consumers”. This user centric approach means that any aspects of data that makes it unfit for use is identified as a DQ problem. In order to understand and identify possible problems, they have found four categories of data quality: intrinsic, accessibility, contextual, and representational aspects (Table 1).

<table>
<thead>
<tr>
<th>DQ Category</th>
<th>DQ Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic DQ</td>
<td>Accuracy, Objectivity, Believability, Reputation</td>
</tr>
<tr>
<td>Accessibility DQ</td>
<td>Accessibility, Access security</td>
</tr>
<tr>
<td>Contextual DQ</td>
<td>Relevancy, Value-added, Timeliness, Completeness, Amount of data</td>
</tr>
<tr>
<td>Representational DQ</td>
<td>Interpretability, Ease of understanding, Concise representation, Consistent representation</td>
</tr>
</tbody>
</table>

**TABLE 1: CATEGORIES AND DIMENSIONS OF DATA QUALITY**

Before more thoroughly explaining the different categories, I want to introduce the users of information systems. Strong et al. identifies three roles in data manufacturing systems (Strong, Lee and Wang 1997):
• Data producers
• Data custodians
• Data consumers

These three roles can be related to the information and knowledge relationships. Data producers externalize knowledge to provide information, while data consumers internalize information to create knowledge. Data custodians come in between, and manage the information to make it ready for consumption. Custodians can be both humans and technology. For the sake of a Web site, it is the interface that enables consumers to internalize information. This interface is developed by someone, and I believe we can consider both the developers and the interface to be custodians (Figure 2-2).

FIGURE 2-2: ROLES OF DATA MANUFACTURING

2.2.2.1 INTRINSIC DATA QUALITY

Intrinsic DQ relates to the data itself. Strong et al. lists accuracy, objectivity, believability and reputation as the four dimensions of this category. When multiple sources are used for the same data, internal mismatches may result. This is considered to be a DQ concern. Initially, users are not able to state which data source is correct, only that the different sources provide different data. There is a believability problem; users do not know what source to believe.

This results in a need to assess the accuracy of the different sources, leading to a reputation dimension. Sources which get known as inaccurate receive a poor reputation. A good reputation allows users to quickly trust the data provided by a source. Likewise, sources with a bad reputation are likely to be discarded without further study. A third option is sources with no reputation, i.e. sources from which no previous data is available. Sources without any reputation are more likely to be considered relevant than sources with a bad reputation, but the problem of believability means that the data cannot immediately be trusted. Having an effective system for assessing and managing reputation will result in a more efficient system overall.
**Objectivity** is the last important aspect to consider when evaluating intrinsic DQ. Users tend to have more trust in objective uninterpreted data. Unless users are able to judge how the interpreted data has been treated, they will have a believability problem.

### 2.2.2.2 Accessibility Data Quality

Accessibility DQ has two listed dimensions, *accessibility* and *access security*. These are both technical in nature.

The **accessibility** dimension concerns problems like lack of computing resources and poor access related to an unstable or missing network connection.

**Access security** deals with problems accessing data due to missing or slow authorization. Data in information systems can be sensitive, requiring users to be properly authenticated before accessing the data. Obtaining clarification in large and complex organizations can be a lengthy process. Information systems with complex security restrictions can also provide problems for computer programs seeking to aggregate information for statistical purposes.

Strong et al.’s study specifically focuses on data quality in context, highlighting user issues related to retrieving and interpreting data. They argue that dimensions from contextual DQ and representational DQ also affect accessibility DQ. While I agree to this assessment, I believe it is sufficient to be aware of this while considering contextual and representational DQ, rather than further complicating the model.

### 2.2.2.3 Contextual Data Quality

Contextual DQ is concerned with data in the context of usage. The listed dimensions are *relevancy, value-added, timeliness, completeness* and *amount of data*.

**Relevancy** is the degree to which the available data is applicable for the task at hand. A data source providing information about the management of an airline company is not relevant when you want to check flight prices, and a data source providing information about timetables is less useful than a source providing real-time data about actual delays (provided that the user wants to know the exact time of arrival).

**Value-added** is the amount of new useful knowledge which can be extracted from a data source, given the current task of the user. If you have several sources with overlapping information, the added value from reading more sources is less than if the sources had no overlapping information. Furthermore, if the kind of data in two sources are not possible to aggregate (due to different scales, properties or accuracy), the added value of using more sources is limited.

**Timeliness** concerns whether the available data is still valid. A review of a restaurant dating from before the head chef was replaced is probably no longer valid. Accurate information
about plane arrivals is not useful if the information is not available until after the plane has landed (given that the user needs this information in order to for example pick up a friend).

**Completeness** is the degree to which a data source is able to provide all the required information for the current task.

The **amount of data** is simply the amount of data available. A large amount of data can result in issues related to retrieving the relevant data. Depending on effective information retrieval, large amounts of data can provide more accurate and reliable aggregation. Large amounts of data can take more time process, however, thus instigating a timeliness problem.

### 2.2.2.4 Representational Data Quality

Representational DQ include interpretability, ease of understanding, concise representation and consistent representation. Many of these dimensions are related to user accessibility as well.

**Interpretability** is the degree to which the required information can be derived from the provided data. Issues may include data using technical terms or coding schemes unfamiliar to the user. Many professional domains have established a terminology not normally used outside that domain. A common example is the frequent use of Latin words among doctors. Interpreting a patient’s journal is no easy task for a layman.

**Ease of understanding** is somewhat similar, but focuses more on how easy it is to understand a data source and its interface. Issues may include data sources using difficult language or search interfaces making it hard for the user to understand how to navigate and find the right information.

**Concise representation** concerns providing information with as little data as possible. When dealing with large amounts of data, it is preferable to be able to extract the relevant information quickly. This is related both to each data source and the number of sources. As far as quick retrieval is concerned, one concise source is the ideal.

**Consistent representation** of data concerns if similar information is provided in a consistent manner. An example of the opposite would be information supplied as images, structured data and unstructured data. Inconsistent representation makes it harder for both humans and computer programs to deal with, and aggregate the data.

### 2.2.2.5 Summing up Data Quality

These four categories and sixteen dimensions provide a solid foundation for studying information systems. The dimensions need to be considered in relation to each other. Although conciseness is valued, it should not mean that completeness is sacrificed. Completeness needs to be seen in relation with timeliness issues related to processing of the
amount of data, and so on. The perfect balance can only (if at all) be found once we know everything about the context in which the data will be applied. Often, however, the same information system will be used in many different situations, meaning that there will have to be trade-offs.

2.2.3 USER GENERATED CONTENT

As has already been discussed, user generated content is an integral part of the “new” Web. A report by Organization for Economic Co-operation and Development (OECD) calls this the participative Web, saying that it “represents an Internet increasingly influenced by intelligent Web services based on new technologies empowering the user to be an increasing contributor to developing, rating, collaborating and distributing Internet content and developing and customizing Internet applications” (OECD 2007). They define user generated content as content that is made publicly available over the Internet, which signifies a certain amount of creative work, and which is created outside of professional routines and practices.

User generated content is different from corporately published content. Corporations will usually have strict guidelines for auditing and publishing content. Updates may be infrequent, and the amount of content may also be limited. On the other hand, the content that gets published is likely to be reliable.

Sites based on content generated by users have to deal with the differing views and perceptions provided by the individual users. There seems to be two main approaches to this:

- Quality, where users contribute to the same article
- Quantity, where each user provide their own interpretation

Wikipedia, as an example of the quality approach, allows all users to contribute, but every topic is only covered once. If many users want to write about World War II, they do so by expanding and refining the same article. By combining the efforts and knowledge of potentially millions of users, Wikipedia has become known as a comprehensive service. The site contains over two million articles in English. The large number of users means that the resulting articles can be very elaborate, and they will usually be free from any strong bias. Extremist opinions tend to cancel each other out, so that only the undisputable facts remain. This approach favors conciseness and objectivity over completeness, and is arguably easier to consume.

An example of the quantity approach is book reviews on Amazon, where every user creates a separate review. Here we are likely to encounter content expressing very different opinions. Instead of cancelling each other out, extremist opinions are more likely to instigate even
more extreme opinions from the other side of the scale. This approach can lead to complete coverage, but at the cost of being more difficult to consume. All the cases of my study employ the quantity approach. The reason for this is simply that I think there is enough to study within this single approach.

User generated content is prone to issues related to believability, lack of objectivity, and accuracy. Many services, including Wikipedia, allow anyone to publish anything, without any direct moderation. Anyone can edit an article, expressing strong personal opinions or (knowingly or not) supply false information. Systems like user voting on the quality or usefulness of an article help filter away poor information, and Wikipedia has implemented features specifying problems with articles (Figure 2-3). This allows users to both assess the quality of the article, as well as encouraging them to help improve the current text.

![Figure 2-3: How Wikipedia denotes possible data quality issues](image)

For services like Amazon’s book reviews, several techniques can be used, which I will explain further when reviewing and discussing my findings.

### 2.2.4 Decision Making

Just as important as the discussion of knowledge and data quality, is the discussion of application. Why do we need all this knowledge? How should we apply it? One common application of knowledge is decision making; knowledge can help us make the right decisions.

The classical theory of decision making assumes that humans make decisions based on rationality, which makes for a conceptually simple model. Given that we fully know all options and the consequences of every decision, humans should, theoretically, always make the same choice. Herbert Simon, an American scientist who has worked extensively with studies of decision making says this about this classical theory (Simon 1979):
“The classical model calls for knowledge of all the alternatives that are open to choice. It calls for complete knowledge of, or ability to compute, the consequences that will follow on each of the alternatives. It calls for certainty in the decision maker’s present and future evaluation of these consequences. It calls for the ability to compare consequences, no matter how diverse and heterogeneous, in terms of some consistent measure of utility.”

It should be noted immediately, though, that Simon does not support this view, but rather considers this model to be inadequate both due to its computational difficulties (knowing everything and considering all options is usually simply not possible) and its failure in empirical studies. He argues that “a strong positive case for replacing the classical theory by a model of bounded rationality begins to emerge when we examine situations involving decision making under uncertainty and imperfect competition” (Simon 1979).

Instead of relying on omniscient rationality, he favors models that either simplify the world in order to make computation possible, or that provide good enough decisions in the real world without too much computation. He calls this bounded rationality, meaning that we base decisions on only a subset of the possibly available information. He considers two aspects to be central to this model, search and satisficing.

The term satisfice, which is a combination of satisfy and suffice, signifies that before searching for information, we have a general idea about how good a decision we have to make, and as soon as we have enough information to make a choice considered good enough, we stop searching and make our decision. Simon points to several empirical studies which both show that the classical omniscient decision making process is failing, and that his model of bounded rationality conforms well with the actual way we make decisions.

Another interesting perspective on decision making is provided by cognitive psychologist Donald Norman (Norman 2004), who argues that decisions are first based on emotions, and then justified using rational thought. Sometimes rationality will override the initial emotional hunch, but the power of emotions is considerable. On a related topic, he also references a study by Antonia Damasio (Damasio 1994) showing that given the option of two or more seemingly equally good options, persons with impaired emotional systems are unable to make decisions. A simple task like choosing between rice and French fries can seem impossible.
2.2.5 **REPUTATION MANAGEMENT**

Resnick et al. (Resnick, et al. 2000) have studied reputation systems on the Internet, with a focus on e-commerce sites like eBay\(^{11}\) and Amazon. They explain reputation systems as a system that “collects, distributes, and aggregates feedback about participants’ past behavior”. Based on previous behavior, we should be able to assess the reputation of a person. Resnick et al.’s perspective is how buyers can trust sellers and vice versa, where the reputation of each is an important aspect. They argue “that prior to the Internet, such questions were answered, in part, through personal and corporate vendors”. Past personal experience and word-of-mouth helped us decide who we could trust.

Resnick et al. examine how trust is built in long-term relationships, listing two main factors (Resnick, et al. 2000):

> “First, when people interact with one another over time, the history of past interactions informs them about their abilities and dispositions. Second, the expectation of reciprocity or retaliation in future interactions creates an incentive for good behavior. An expectation that people will consider one another’s pasts in future interactions constrains behavior in the present.”

In order to build a positive reputation, producers of information need to continuously supply high quality content. Sources with a good reputation will be more valuable to users seeking reliable information, and Web sites need to make sure users are able to assess the validity of contributions. Resnick et al. argue that effective reputation systems need to provide at least three properties:

- Long-lived entities that inspire an expectation of future interaction
- Capture and distribution of feedback about current interactions (such information must be visible in the future)
- Use of feedback to guide trust decisions

Reputation can be seen as an enabling factor, which both inspires data producers to create good content, and help data consumers to find believable information. As we shall see, Web sites acting as data custodians can benefit greatly from implementing an effective reputation system.

\(^{11}\) http://www.ebay.com/
2.3 ON THE INTERACTION – HUMAN-COMPUTER INTERACTION

Human-computer interaction (HCI) as an academic field roots back to the 1960’s, when many of today’s well known principles saw the light of day in university research (Myers 1998). These principles include direct manipulation of graphical objects, the mouse, text editing and hypertext. The exact range of HCI is not finite, but a working definition provided by the ACM SIGCHI (ACM’s Special Interest Group on Computer-Human Interaction) describes HCI as “a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them” (ACM SIGCHI 1992).

This definition is focused around computers, while acknowledging that they are related to humans as well as other phenomena. Although HCI is often seen as a subset of the broader computer science area, it is also closely tied to human oriented sciences, such as communication theory, design, linguistics, social sciences, and cognitive psychology (ACM SIGCHI 1992). HCI is largely interdisciplinary, and seems to rely on other sciences “as needed”.

Why is HCI important? A Web site may contain all the information in the world, but will have no value to users if they cannot find what they are looking for. A good interface should aid the user when necessary, and otherwise step out of the way. Steve Krug (Krug 2000) has probably summed up the goals of designing user interaction better than any other: “Don’t Make Me Think!” When interacting with Web sites, users should immediately understand what the site is about and what she can do there.

Although “don’t make me think” is a useful guideline, Web sites and other high-tech products can benefit from more formalized theory. I will explore the aspects of user-centered design (Cooper 2004) (Preece, Rogers and Sharp 2002), information architecture (Morville and Rosenfeld 2006), and usability (Nielsen 1999), in order to be able to evaluate the properties of user interaction with Web sites. Much of the theory in this subchapter has been used as background material for designing and performing the cases of my research. It is my belief that understanding the process and aspects of designing interaction will make it easier to later evaluate interaction.

2.3.1 USER-CENTERED DESIGN

Most high-tech products, and certainly Web sites, are intended for users. Involving users in the design and development process will produce better results, and the design and features of a product should only serve to aid the user reach his goals. Gould and Lewis argue “that any system designed for people to use should be easy to learn (and remember), useful, that
is, contain functions people really need in their work, and be easy and pleasant to use” (Gould and Lewis 1985). They list three key principles that should help designers achieve these goals:

**Early Focus on Users and Tasks** – First, designers must understand who the users will be. This understanding is arrived at in part by directly studying their cognitive, behavioral, anthropometric, and attitudinal characteristics, and in part by studying the nature of the work expected to be accomplished.

**Empirical Measurement** – Second, early in the development process, intended users should actually use simulations and prototypes to carry out real work, and their performance and reactions should be observed, recorded, and analyzed.

**Iterative Design** – Third, when problems are found in user testing, as they will be, they must be fixed. This means design must be iterative: There must be a cycle of design, test and measure, and redesign, repeated as often as necessary.”

When their paper was written, they found that very few designers actually followed these principles, even though most considered them to be obvious once presented. This is backed up in Donald Norman’s *The Design of Everyday Things* (Norman 1988), where he explains many of the shortcomings of product design in the 1980’s. Since then, these design principles have become more and more accepted, and as Preece et al. explain (Preece, Rogers and Sharp 2002), several methods have been developed for this kind of process.

Nevertheless, the extent to which user-centered design is actually applied is probably less than the acceptance of its validity, and we continuously experience products which cause more frustration than delight. Alan Cooper’s seminal *The Inmates are Running the Asylum* addressed this problem, and also introduced his Goal-Directed design process (Cooper 2004). This method was employed as part of my research, and I will discuss it in my chapter about methods.

### 2.3.2 Information Architecture

There are many ways to consider information architecture. In their book, *Information Architecture for the World Wide Web*, Morville and Rosenfeld (Morville and Rosenfeld 2006) provide several definitions, highlighting the various possible interpretations. I have found the following definition to be especially useful:
“[Information architecture is] the combination of organization, labeling, search, and navigation systems within Websites and intranets.”

This definition describes information architecture from a Web centric perspective. Organization of large amounts of content requires a well thought out structure. What content belong to what section of the site? How do we label those sections? How do we navigate between and within sections? How does the search functionality work?

Morville and Rosenfeld list four basic information architecture components:

- Organization systems
- Labeling systems
- Navigation systems
- Searching systems

Although they acknowledge that this categorization is neither absolute nor perfect, it can provide a useful framework for further studies. The underlying premise is that there is some information available, and that that information should somehow become knowledge in the heads of users. This is similar to the topic of my study, and information architecture is part of the magic that make this transition possible. Through careful organization and labeling, data is structured and presented in a meaningful manner (as information). Users are then enabled to navigate and/or search this structure. To better understand the four components, I will explain a bit further (this entire section is based on the work by Morville and Rosenfeld).

2.3.2.1 Organization Systems

Information can be organized in a variety of ways, and this organization can be considered from several perspectives. One possibility is to use an exact scheme, organizing information alphabetically, chronologically or geographically. All three schemes provide logical organization that can be easily understood by the user. Morville and Rosenfeld also list a number of ambiguous schemes, including topic, task, and audience oriented; what scheme to use depends on both the nature of the information and the context of use. Alphabetical ordering makes sense if the user is looking for an entry in a catalog, while chronological ordering can be appropriate on a news site. If a user is looking for an article about a specific topic, however, neither chronological nor alphabetical ordering is much use.

When designing organization systems, developers need to consider both the information and the context, and provide a system which provides the proper balance. Often, an organization system will use a combination of schemes, i.e. alphabetical ordering within a topic. Relational
databases allow developers to separate data and presentation, thus allowing a flexible organization.

An interesting example of this is Digital Web Magazine\(^{12}\), which allows users to access articles by topic, date, author, title and type (Figure 2-4). Although the content is the same, users will be in different modes when entering the site. Dedicated users are perhaps checking the site every few days and want to see the most recent articles. Other users may have read a book by a specific author, and want to see what he has written for Digital Web Magazine. Others still may want to read articles about, for example, information architecture, no matter when or by whom they were written.

![Digital Web Magazine](http://www.digital-web.com/)

**Figure 2-4: Different Organization Schemes – Digital Web Magazine**

### 2.3.2.2 Labeling Systems

Labels are used to explain larger chunks of information in a concise form. Different kinds of labels include contextual links, headings, navigation system choices and index terms. *Contextual links* and *navigation system choices* label content that is available elsewhere. Some information about the domain in which the label is applied can probably be derived from the context (including site topic, sub groupings in the navigation, and surrounding words), but it is nevertheless important to ensure that the labels are appropriate for the context, and that users get the right expectations regarding what they will get if they follow these links.

Headings describe the content that follows on the same page. Although headings should be informative and enable easy scanning of a page, headings can afford to be less precise, since users can supplement by reading the first few sentences of the related content.

2.3.2.3 Navigation systems

The two main goals of a navigation system are to tell users where they are and where they can go. Users should know both what site they are on, and where they are on that site. The hypertextual nature of the Web allows users go from one place to any other at the click of a link. This freedom of movement means that the physical limitations of the real world are completely bypassed, and that the hierarchical structure underlying a data set can be circumvented at the developer's pleasure. When users have the option of free movement, it is even more important to let the user know what each destination provides, and help the user decide which destination is most relevant. It is probably better to provide a few easily understandable choices, than to clutter a page with links to every other possible page.

Morville and Rosenfeld mention two types of navigation systems:

- **Embedded navigation systems** – Integrated into sites, these include global, local and contextual navigation
- **Supplemental navigation systems** – Often separate pages, these include sitemaps, indexes and various guides

Navigation of Web sites is often a step by step process. Users see a list of options, and click the one that seem most relevant. The actual page they are looking for can be buried deep in the hierarchy.

Large Web sites can be especially hard to navigate, since there can be many levels of hierarchy to traverse. In order to limit the amount of choices on each page, it is common to use deep category structures. If each level in the hierarchy is wide, it can be even more difficult to find your way. One of my case studies was the e-commerce site Amazon. This site is both broad and deep. The hierarchy for one of the categories is like this:

- Books – 33 categories
  - Computers & Internet – 21 categories
    - Web Development – 10 categories
    - Web Design – 8 categories
      - Web Graphics – 6,429 books

Needless to say, this is many steps with a lot of choices at each step. Even when reaching the last navigation page, there are still over six thousand books to choose from.
Sitemaps can help users find the right section faster, by providing an overview of the possible sections and subsections. An index allows users to navigate within the familiar system of the alphabet, provided that they know exactly what they are looking for.

2.3.2.4 Searching systems

Searching can be an efficient way of finding the information we are looking for. If the previous example of Amazon was the only way to find books on the site, it is doubtful that it would be used at all. However, since Amazon also supports searching, we can simply enter the name of the book in the search field on the front page and come directly to a search result page where the book is probably on top if we know the exact title.

Searching can be an important feature to provide for many kinds of services. I will not discuss the underlying algorithms and structures behind a search interface, but only focus on the presentation and the user experience. There are mainly two aspects to consider; what information should be provided, and in what order.

Morville and Rosenfeld argue that the amount of information presented in a list of search results should depend on the kind of user. If a user knows what she is looking for (a specific book title), just listing the titles makes sense. However, if the user only roughly knows what she wants (a book about a topic), providing a summary or an abstract is useful. Morville and Rosenfeld suggest that users should be able to decide for themselves whether they want to see summaries or not.

Search results are also ordered, either by sorting (by title, by author, chronologically) or by ranking (by relevance or popularity). What to use is also context dependent, and it is a good idea to allow users to decide themselves.

With the rise of Web 2.0 and user generated content, collaborative filtering can help users find what they are looking for. By allowing users to review books on Amazon, the service can also present search result where books with the most favorable reviews are listed first.

2.3.3 Usability and design

WordNet defines usability as “the quality of being able to provide good service” (Princeton University n.d.). Preece et al. (Preece, Rogers and Sharp 2002) elaborate on this to provide six goals products with good usability should achieve:

1. effective to use
2. efficient to use
3. safe to use
4. have good utility
5. easy to learn
6. easy to remember how to use

This can be summed up to mean that a product with good usability should be easy to understand, and safely and efficiently do what it is supposed to do.

Donald Norman lists visibility, feedback, constraints, mapping, consistency, and affordance as six aspects that help create products with good usability (Norman 1988). Most of these terms are quite straightforward, but the last term, affordance, might deserve extra attention. Norman explains affordance as “the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used” (Norman 1988).

Preece et al. also argue that designers should consider several user experience goals, meaning that a product should not only do what it is supposed to do, but that it should be pleasing to use as well. Again, this can be linked to Norman, who in his book Emotional Design (Norman 2004), explained the importance of attractive and pleasurable design. He argued that products that are pleasurable to use, will also score better on several usability goals.

Good visual design is important for creating a pleasant user experience (humans like pretty things), as well as making an interface understandable. Robin Williams (Williams 2004) lists four basic design principles, contrast, repetition, alignment and proximity. In addition, she identifies typography as an aspect of its own. If applied correctly, these principles help users identify relationships between content. Typically, large letters signify importance, and faded colors signify reduced importance.

It is not the aim of my study to evaluate the aesthetic properties of Web sites, but since design is an integral part of the experience, it helps to be aware of the fundamentals. Bad design can be just as damaging as bad information architecture. Many modern Web sites contain an abundance of information on each page. Helping the user to separate signal from noise also means helping the user find the information she is looking for.

Is the content up front and center, or is the page filled with ads, unrelated images and other distracting content? Since users have become more and more immune to ads on Web sites (Nielsen 2007), many designers are constantly trying to make them more prominent and attention grabbing. Although site owners need to secure revenue by ensuring that their advertisers are satisfied, they also need to ensure that their actual users are happy. Visual design can help find the right balance.
2.3.4 Evaluating Interaction

Having identified important aspects of human-computer interaction, it is also valuable to be able to assess how a product performs according to these aspects. Although a designer with a good understanding of interaction design and methods are more likely to create successful products, testing and evaluation is still important. Preece et al. argues that “just as designers shouldn’t assume that everyone is like them; they also shouldn’t presume that following design guidelines guarantees good usability” (Preece, Rogers and Sharp 2002). Evaluation is performed to ensure that the implementation match the previously identified goals.

Preece et al. identify four evaluation paradigms:

- **Quick and dirty** – informal, confirming that ideas are in line with users’ needs
- **Usability testing** – formal testing on users with defined tasks in a controlled environment, often recorded and supplemented with questionnaires or interviews
- **Field studies** – observations done in the product’s natural setting, aiming to understand actual use
- **Predictive evaluation** – experts applying their knowledge of typical users, often guided by heuristics to predict usability problems

Within these four paradigms, different techniques are used, including observing users, asking users, asking experts, testing users and modeling users’ task performance (Preece, Rogers and Sharp 2002). I am mentioning these paradigms here, as my work with the case studies were partly based on using evaluation technologies for exploring Web sites.

2.4 Closing Remarks on the Theory

As this rather extensive theoretical review has indicated, the Web is a complex phenomenon which cannot easily be understood properly without drawing on several academic fields. Although my analysis is mainly based on the fields of media studies, knowledge management and HCI, many more could be applied. All these three fields are themselves drawing on or bordering to other fields. It is my belief that this multidisciplinary approach will provide a more accurate understanding, and this forms the basis for the rest of this thesis.

My discussion of method, cases, and findings will mostly be based on the theories from HCI and knowledge management, while I will return to media studies to tie everything together in the discussion in Chapter 6.
3 METHOD

After establishing research questions, the next task is to find out how to answer them. Different methods will provide different results, and it is important that the methods we use are well suited. When making this decision, we need to consider what method will provide the most relevant findings, while also considering what is possible to achieve during the time span of the study and with the available resources.

According to David Silverman, methodology “refers to the choices we make about cases to study, methods of data gathering, forms of data analysis etc., in planning and executing a research study” (Silverman 2005). The most general distinction is between quantitative and qualitative methodologies. Quantitative research systematically investigates numerical properties of phenomena and applies statistical analysis of the gathered data, whereas qualitative research is dedicated to understanding the reasons behind some phenomenon. Typically, qualitative research is applied to only a small sample of data, where each sample is thoroughly investigated. The focus of a qualitative study is the specific aspects of that sample, rather than (as is usually the case in quantitative research) the overall tendencies of a large sample set. While quantitative research often seeks answers to questions beginning with when, how much and how many, qualitative research focuses on why and how.

In this chapter I will explain the reasoning for my methodology choices and how I have performed my research. Subchapter 3.1 will explain why I chose qualitative research as my approach. In subchapter 3.2 I introduce a simple hypothesis forming the foundations for my work with information, knowledge and presentation. Subchapter 3.3 explain the process, tools and methods I have used, before subchapter 3.4 closes this section with an assessment of the validity of my data findings.

3.1 CHOOSING A METHODOLOGY: QUALITATIVE RESEARCH

The initial motivator for my research was the assumption that information technology can help people find, organize, and understand information. The Web has enabled enormous amounts of information to be accessed from a single terminal.

During the courses of my study at the University of Oslo, I found that very much research pointed out the shortcomings of technology. Although I do agree that there are problems regarding both implementation and use of technology for information retrieval and collaboration, I also acknowledge that many systems are successful at what they do. Rather than doing an analysis of the failure of technology, I wanted to explore how and why some services “get it right”.

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I wanted to study large successful Web sites, and see how they integrate technology and users to provide useful services. During the initial phases of my work, I spent much time figuring out exactly what I wanted to study, and how I should approach it. A recurring topic seemed to be that modern people suffer from information overload, there is so much information being pushed at us that we are having trouble coping. The mere existence of millions of Web sites, however, indicates that someone is doing something right. Somehow, all this information is made into useful knowledge in the heads of human beings.

I wanted to understand the mechanisms that make these successful Web sites work. How do their user interfaces help users find information? Why is the interaction designed the way it is? How can users assess the validity of information?

Research has been done to create models for finding quality in social media (Agichtein, et al. 2008) and measuring quality of articles in Wikipedia (Hu, et al. 2007). These studies provide complex algorithms for assessing quality, but the results are based on assumptions like “contributions by authoritative authors are likely to be of high quality”. This can provide information about what articles are likely to be of high quality, but does not state whether articles actually are. Although useful, I am more interested in understanding actual quality.

Both information and knowledge are difficult to quantify. We can count the number of words in a text, but it is difficult to count the information in the text. I also found that aspects such as data quality and effectiveness of user interfaces are similarly hard to quantify. When adding context and subjective user needs when trying to understand how individual users can solve actual problems using the Web, generalizations and quantification of attributes are likely to be misleading.

The previously described model of data quality (Strong, Lee and Wang 1997) begins in the other end, trying to identify the quality of each aspect of a single article. When validating quantitative findings like Agichtein et al.’s and Hu et al.’s, there needs to be some human interaction; issues like timeliness, user needs, and contextual relevance are near impossible to measure automatically.

What I decided to ask instead, was how some sites organize their content generation and presentation. This naturally led to qualitative research as the main research approach, with a focus on exploration. Although I had an idea about the problems the sites’ were expected to solve, I did not have a clear idea about how they achieved that. In order to understand the principles guiding the sites, I decided to perform case studies.
3.1.1 **Case Study Research**

A case study is a method which allows us to get a lot of information from a limited sampling. Silverman lists three different types of case studies, *intrinsic, instrumental* and *collective* (Silverman 2005). Intrinsic case studies are only concerned with the case itself. Instrumental and collective case studies are more concerned with the phenomenon they represent, and are thus more suited for generalization. As research is expected to provide new valuable knowledge, intrinsic case studies are often considered to be weak.

While case studies are often limited by the cases we have access to, this is less of an issue when the cases are openly accessible Web sites. By choosing to study Web sites, I had a wide range of possible cases to choose from. This allowed me to pick cases based on expected and experienced properties that I thought would provide interesting results. When picking cases, I decided to choose Web sites with a quantity approach to user generated content, but with differing applications of that content. I chose one Web site where user profiles were very important, one site where profiles were available, but less emphasized, and one site where there were no profiles at all. This was expected to allow me to see different approaches to a similar problem.

3.2 **A Hypothesis for Modeling Information and Knowledge**

When beginning the preparation for my cases studies, I had the assumption that the Web is full of information, and that the goal of the Web sites studied is to enable users to internalize this information to become knowledge. In order to understand the possible relationships, I formulated two very basic models. I considered the amount and quality of information, and what the services did to help the user understand and acquire this information. The amount of knowledge derived from an available information source defines the service’s conversion rate:

\[
\text{Knowledge/Information} = \text{Knowledge Conversion Rate}
\]

The idea of this simple formula is that if we are able to measure the amount of information on a Web site, and also the amount of knowledge a user can generate from this information, we can arrive at “quantifiable” knowledge conversion rate. As I have already hinted at, both information and knowledge is almost impossible to measure unless the context in which it is applied is heavily generalized. As it is seldom the case that a person’s objective for visiting a Web site is to find, read, and understand all the information that is available on the site, actual success depends on both the visitors prior (tacit) knowledge of the topic, and the current objective. Although not useful for accurate quantification, the formula can help understand the mechanisms at work.
If we change the perspective somewhat, we get another formula:

\[
\text{Information} \times \text{Presentation} = \text{Knowledge}
\]

This formula acknowledges that something happens between information and knowledge, and suggests that a well designed user interface will help users extract the knowledge they seek. Given this formula, we get three aspects to study.

These two formulas are simple by intent, and are not meant to be able to define any absolute truths. Rather, they are designed to give an idea of the different components of knowledge internalization and thus guide the research effort.

### 3.3 Performing Research: Tools and Methods

When studying the Web sites, I began by examining the services the sites provided, and the type of information that was relevant for my study. The next step was to find out how that information was likely to be applied. What constitutes success? Planned application of the knowledge acquired may vary, and the success rate may differ depending on the goals.

The actual research consisted of four parts. First I developed scenarios to help me explore how real users where likely to interact with the sites. Second, I performed an analysis of data quality issues. Third, I performed a heuristic evaluation targeting usability and interaction. Finally, I analyzed the results of the three previous steps, trying to identify the most interesting aspects. Although presented here sequentially, I frequently returned to the scenarios during the other phases.

#### 3.3.1 Exploring the Sites: Goal-Directed Design

When focusing on subjectivity, I decided to turn to Alan Cooper’s method Goal-Directed Design (Cooper 2004). This method focuses on personas, goals and scenarios, aiming to most accurately identify actual use of an application. Although aimed at design teams producing high-tech products, I believe the principles are just as valid for testing and evaluating Web sites.

Personas are detailed descriptions of users and their goals. Rather than generalizing users (i.e. most users would want something like this) we identify specific needs (i.e. John Doe the rocket scientist likes complicated technical descriptions when shopping for cars).

During the process of defining personas, we are also defining the goals. Cooper states goals as the reason for performing tasks, and highlights that programmers will often tend to focus more on tasks, thus ruining the user experience.
When working with goals and personas, we begin in both ends at the same time, and arrive at proper goals and personas through several iterations. Once goals and personas are established, we can create actual scenarios, which are tasks we let our personas perform in order to reach the predefined goals.

Although personas are made up, and surely not without shortcomings, they allow the development process to be structured around concise goals and problems rather than general tasks and assumptions.

I chose to use Cooper’s Goal-Directed Design process to create realistic scenarios in order to get to know the Web sites I studied and how they interact with actual users. I started by examining the sites in general, attempting to discover the kind of information they provided, and what were likely goals for visitors. Based on this information I developed personas and concrete goals, which I would use as a basis for performing scenarios.

By performing scenarios I discovered the detailed step-by-step processes that the Web sites required users to perform. While following them, I noted both many potential issues and clever solutions. They formed the basis for more formal study of data quality aspects and the interaction design of the sites. I first performed an analysis based on the categories of data quality (Strong, Lee and Wang 1997), and then performed a heuristic evaluation based on guidelines by Jakob Nielsen (Nielsen 1994).

3.3.2 Analyzing Data Quality

Once I had established a solid understanding of the content of the Web sites and the way visitors were likely to interact with them, I was ready for a more formalized analysis of data quality. This analysis was based on Strong et al.’s four categories of data quality (Strong, Lee and Wang 1997). I went through all the categories and their dimensions for each of the sites, taking note of both evident and suspected issues, as well as performing a cursory exploration of what the sites did to handle the issues. A more thorough investigation of the handling was done later, when I had a better understanding of both the content and the interaction design of the sites.

The data used for the analysis was gathered through exploration of the sites. This exploration was a combination of performing scenarios (to highlight actual use) and free browsing (to be able to note issues which may not be in focus when performing scenarios). I made notes throughout the process, and then performed the analysis immediately afterwards. During the analysis, I also returned to the site being studied to gather more information.
3.3.3 **Heuristic Evaluation**

Heuristic evaluation is a method for quickly evaluating a system based on a set of criteria (heuristics). This method was developed by Jakob Nielsen and his colleagues in 1990 (Nielsen and Molich 1990). In its most basic form, heuristic evaluation is done by looking at an interface and trying to state what is good and bad about it. Most designers apply this technique whenever they create an interface, although mostly based on intuition and their own idea of what works and not. Nielsen and Molich argue that by establishing a small set of formal rules or guidelines, heuristic evaluation will be much more successful. In their paper, they present nine such usability guidelines.

In an article on his Web site, Nielsen has expanded this to include ten guidelines (Nielsen 1994):

1. **Visibility of system status** – The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
2. **Match between system and the real world** - The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
3. **User control and freedom** – Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
4. **Consistency and standards** - Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
5. **Error prevention** – Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
6. **Recognition rather than recall** – Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
7. **Flexibility and efficiency of use** – Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
8. **Aesthetic and minimalist design** – Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue
competes with the relevant units of information and diminishes their relative visibility.

9. **Help users recognize, diagnose, and recover from errors** – Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

10. **Help and documentation** – Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

These guidelines are aimed at computer programs in general, and not the Web *per se*. Keith Instone has provided an elaboration of these points for use on the Web (Instone 1997). Although more than ten years old, his adaptations are still relevant, and deals with issues common to modern Web sites. When performing the evaluation, I used Instone’s input as an extra guideline.

The purpose of the heuristic evaluation was to get a systematic understanding of the user interface, specifically looking for things that normal users would not consider. As stated earlier, a good interface gets out of the way. In order to study the interface, it helps to have some specific criteria to look for. During the heuristic evaluation, I took note of both positive and negative findings.

### 3.3.4 ANALYZING FINDINGS AND FURTHER EXAMINATION

Both the data quality analysis and heuristic evaluation turned out to be somewhat problem oriented. Throughout the process, I was aware of problems and solutions encountered, and afterwards, I had a long list of comments and notes about all the cases.

When analyzing this data, I read through my notes and tried to make each point more concrete and context related. By combining the different findings and returning to the Web sites to explore them further, I was able to extract several assumed best practices, based on how each site dealt with identified issues. This left me with a long list of features and guidelines for each site.

I then grouped the findings across the cases, so that I had five groups: four groups for each of the data quality categories, and one group for the heuristic evaluation. Based on this extensive list, I identified three key aspects for further studies. These three aspects are the ones that will be discussed in Chapter 5: Research Findings.

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3.4 Assessing the Validity of My Data

All the data I have collected has a subjective flavor. I performed the scenarios myself, and it is reasonable to assume that someone else doing the same study could very well make other findings. However, since my study was exploratory, I believe that my findings are both valid and relevant. The goal was to find something which could affect the knowledge creation process, and not to find all things or to make a reliable assessment regarding how effective each finding was.

Applying analysis based on frameworks like Strong et al.’s categories of data quality and Jakob Nielsen’s heuristic evaluation helped me find structured data which can be understood and interpreted on its own. This can make the findings more generally applicable, and also more reliable, since they are based on established methods.

A possible limitation of my study is that I did not approach the Web sites with “fresh eyes”. I was familiar with all the sites up front, which was important to help me choose which sites to study. The analysis is based on a lot of theory, meaning that it would be difficult to let someone unfamiliar with the theory perform the same kind of analysis. I wanted to discover why and how the services worked, rather than just whether they worked or not. Although usability is an important part of my study, it was not my goal to do a usability study per se.
4 CASES

This chapter describes the three Web sites I have used for my case study. I start by explaining why I have chosen those sites, and then follow up with a more thorough description of the cases and the scenarios I developed for each. The findings are described in the next chapter.

4.1 CHOOSING WEB SITES TO STUDY

I have chosen to study large Web sites which are known to excel in their respective areas (amount of information, quality of information, ease of retrieval, etc.). Web sites relying on user generated content are vulnerable to low levels of users. If no one contributes content, the site suffers, and it is harder to assess the value of the technology behind the service. Large successful Web sites are less likely to suffer from this problem.

The three sites I selected were Amazon, Booking.com, and LinkedIn. They all provide distinctly different services. Amazon sells books (and lately many other products); Booking.com provides a hotel booking service, and LinkedIn is a community for building professional relations and accessing the expertise of other professionals. For all the sites, my main focus is user generated content, although Amazon and Booking.com also provide editorial content.

For all the sites studied, I applied Cooper's Goal-Directed Design method (Cooper 2004). I developed personas, goals and scenarios. When developing the scenarios, I wanted to identify probable goals, highlighting actual use of the services. The goals should be natural, and simulate goals visitors to the sites were likely to want to accomplish.

4.2 AMAZON.COM

Amazon has grown to become one of the largest e-commerce sites on the Web. The site started out selling books, but has since expanded to sell many other products, including electronic equipment, clothes, beauty products, and power tools. Amazon was chosen because it is an established site, has a large user base, and has been known to be innovators within their field.

In my study, I have only focused on the book section. Many of my findings will probably apply to other parts of the site, as well. I chose the book section because that is the main feature of Amazon, and I would assume that it is therefore the most mature and developed section. Books are also a product which is easily reviewed, promising large amounts of content.
Almost every released book on Amazon has one or more reviews attached to it; the most popular books have several thousand user generated reviews. These reviews are supposed to help users make a decision about whether a book is worth buying or not.

I developed two scenarios, both focusing on non-fiction books:

1. Find information about a specific book
2. Find a book within a certain domain

4.2.1 Find Information About a Specific Book

This task was designed to find out how Amazon can help a user decide whether to buy a specific book or not. The persona developed was a Norwegian student, Espen, in his mid-twenties. He is interested in global issues, and has taken an especially keen interest on the 2008 presidential election in the USA. Having spent a lot of time reading both Norwegian and American on-line newspapers, he has been intrigued by one of the candidates for the Democratic Party, Barack Obama. He has seen many references to Obama’s book “The Audacity of Hope”, and is wondering whether he should read the book or not. His goal is to be able to make an informed decision about the book’s relevance.

This scenario included a book which had a tight connection to current political events. This meant that politically engaged readers were likely to have biased opinions, and that there might be a shift in the content of the reviews over time. The book was written some time before Obama announced his candidacy, and I performed my study well into the primary season, at a point where Obama seemed likely to win the Democratic nomination.

4.2.2 Find a Book Within a Certain Domain

This scenario was designed to find out how Amazon can help a user to find books covering a specific domain, and how a user can decide which book is right. The persona developed was a Webmaster, Jackie, working for a small Internet startup. Jackie is an experienced programmer, and has developed Web sites using PHP for many years. After meeting a marketing executive at a seminar, he got the impression that Search Engine Optimization (SEO) is something he has overlooked. After doing some searches on the Web, he has decided that he needs to get a proper book to teach him both the basics and the more advanced principles of SEO. He is technically savvy, and wants a comprehensive book aimed at professional developers. The domain of SEO is an ever-changing one, so the book should be quite recent. His goal is to be able to decide which one book will best suit his needs.
This scenario was likely to include many possible books. The problem was to decide which one book was most relevant. Although people have different preferences regarding writing style, I expected reviews to be factual and to the point.

4.3 Booking.com

Booking.com is a Web site providing services for booking hotels worldwide. The site allows users to either browse or search for hotels, providing information about prices, services and customer satisfaction. Every hotel on the site has an informational page, provided by the hotels themselves, and a guest reviews page, provided by actual guests. Booking.com allows users to book hotels, often at reduced rates.

The site contains more than 40,000 hotels, and the amount of user reviews for each hotel range from a dozen to several hundred. One especially interesting feature is the possibility to filter reviews based on the type of reviewer (i.e. young couple or family with older children), promising more relevant information.

Users of Booking.com are expected to perform one basic task: find a hotel and book it. I have only studied the process of finding a hotel, since this is the part of the service that requires users to find and navigate information to make a decision.

In order to focus specifically on the information retrieval process, I have created three scenarios, where only one of them actually includes finding a hotel to book.

1. Find a hotel to book in Barcelona
2. Find information about a hotel in New York City
3. Find the address of a hotel in Oslo

4.3.1 Find a Hotel to Book in Barcelona

This scenario was designed to find out how a typical user session could be on the site. The persona developed was a 25 year old male from Norway, Knut, travelling to Barcelona for two weeks with his girlfriend in July. They want to experience as much of the city as possible, as well as spend a few days sunbathing at the beach. Both Knut and his girlfriend are students, so they prefer cheap rooms rather than splendor. It is not important to meet other travelers or locals. They have never been to Barcelona before, so they have no familiarity with the different parts of the city. Knut’s goal is to be able to find a hotel he is sure will satisfy their needs, albeit on a reasonable budget.

I believe this scenario represented a very likely user session, and should highlight how the site’s most important functionality works. I expected to find a lot of hotels, and that the main problem would be to find which one hotel was best
4.3.2 FIND INFORMATION ABOUT A HOTEL IN NEW YORK CITY

This scenario was designed to find out how the site’s interface was suited to help someone looking for a specific hotel. The persona developed was Jennifer, a young girl from London. Her brother is travelling to New York City; and she wants to get an impression of his hotel. She knows the name of the hotel and that it is located somewhere in New York City, but not anything else.

This scenario examines how Booking.com performs a pure information retrieval service. The focus of this scenario was to discover how a visitor would find a specific hotel, as well as consider the value of information presented about the hotel.

4.3.3 FIND THE ADDRESS OF A HOTEL IN OSLO

This scenario is somewhat similar to the previous one, but here the visitor is looking for a specific fact about a hotel. The persona developed was a business manager, Mr. Andersen, who had a business associate attending a conference in Oslo. He had promised to pick her up at the central station and drive her to the hotel, so he needed to find out its location. He lived in Oslo, and knew his way around town.

This scenario examines both the task of finding a specific hotel, and how easy it is to find a specific piece of information about that hotel.

4.4 LINKEDIN.COM

LinkedIn is a community-based Web site allowing you to connect to your professional network. Like many other communities, it allows you to have a profile and a list of friends. Unlike many other communities, the site has a strong professional focus, and most of the services are strictly business oriented. LinkedIn defines its three services as allowing users to:

- Stay in touch
- Discover job & business opportunities
- Get expert business advice

My main focus was the last point. LinkedIn provides the opportunity to ask questions and receive answers from other users. Answers can be asked within numerous categories and subcategories, targeting professionals within these domains. The Answers service is accessible without logging in or registering, but in order to ask or answer questions, a profile must be register.

During my study of this site, I used my own personal profile. I had been on LinkedIn for a couple of months, and had a few dozen contacts. I had not been actively using LinkedIn, and never asked nor answered any questions. I do not believe there was anything about my profile
that should significantly affect the answers I received, except perhaps a lack of reputation. Users known to contribute good answers may perhaps receive some extra attention from other users. I have not examined this further, and will assume that this is not a significant issue with regards to my current study.

When designing scenarios for LinkedIn, I tried to formulate questions were I expected to find diverse answers. Rather than asking questions with a single “right” answer, I wanted to ask open questions allowing a range of perspectives. The topics I asked about were chosen in part based on personal interest. The main reason for this was to be better able to evaluate relevance and quality of the answers. LinkedIn is aimed at professionals, and I believe that in order to evaluate the site within this professional context, some understanding of the topic is required.

For this case, the goals of both scenarios were to find as much relevant information as possible about a certain topic, defined by a specific question. I formulated two questions:

1. How do you deal with issues related to the quality of user generated content?
2. What should I do to improve the Click through Rate (CTR) of my web site ads?

4.4.1 How do you deal with issues related to the quality of user generated content?

The persona for this question is Dan, a developer working on a new Web application. The application will be a guide to restaurants in Oslo. The application will rely on users to provide articles and reviews, and he wants to find out how he can ensure that the quality of content is as good as possible, while at the same time encouraging contributions from users.

4.4.2 What should I do to improve the Click through Rate (CTR) of my web site ads?

The persona for this question is David, a Webmaster running a Web site. The sites has many ads provided by external advertisers, and he wants to ensure that they receive as many clicks as possible, without imposing too much on the users. His goal from LinkedIn is to pick up techniques that he can use to improve his Web site.
5 RESEARCH FINDINGS

This chapter provides a representation of the findings from my research cases. My research was based on the categories of data quality and a heuristic evaluation. By analyzing that data, I have extracted three main findings, related to search, user recommendations, and reputation. In subchapter 5.1, I will explore filtering and presentation of search results. In subchapter 5.2 I will discuss the different sites allows their users to help each other find what they are looking for. Finally, I will describe how user profiles are implemented to help build reputation and authority. This will be the topic of subchapter 5.3.

In the appendix, I have included an extensive list of findings and recommendations directly related to data quality and the heuristic evaluation. These findings were not included here, since they do not directly contribute to my discussion, and were mostly used as background information.

5.1 SEARCH AS THE PRIMARY NAVIGATION METHOD

For all scenarios on all the sites, I naturally turned to search to find what I was looking for. I usually consider myself to be more of a browser, and will often begin by browsing and then only search if I cannot find what I am looking for.

I would assume that the reason for this search oriented behavior is the amount of information, and the design of the sites. All three sites put the search functionality front and center, encouraging searching over browsing. I would assume that the sheer amount of content on each site favors searching. As we have already seen on Amazon, content can be “hidden” in a hierarchy with a plentitude of both levels and options on each level. When arriving at the last level, we can have thousands of books to consider, with no other help that sorting for finding the right book. LinkedIn does not have any metadata attached to their content (apart from date, author and category), meaning that browsing can be a tedious process. Booking.com actually also encourage browsing by putting several popular cities on the front page. We do, however, have to input date information and perform a search to get price information.

When searching, I effectively bypass the site’s organization, and much of the labeling as well. The global navigation is also ignored, leaving only contextual navigation systems. This makes the design of the search interface critical. I will explore how filtering can help users narrow the result set and how presentation of search results can help users make quick decisions about what content they want to explore further.
5.1.1 FILTERING

A common feature on all the sites was the ability to filter search results, and thus limit the amount of possible choices. As a common problem was that searches could return very many results, being able to narrow down the number of results meant that it was easier to find the most relevant information. Booking.com (Figure 5-1) and Amazon (Figure 5-2) provided an indication of how many results I would get if I applied each filter, which can help me ignore filters that will not provide any relevant results.

Bookings.com had a slightly different solution than Amazon and LinkedIn, and allowed me to filter on several criteria. The information on Booking.com has more relevant attributes, which can explain this differing approach. If I happen to require Internet services on my room, it is nice to be able to only see hotels that provide this service.

Amazon and LinkedIn required me to select categories. This makes sense, since the information type lends itself to categorization. However, by providing me with numerous levels with sometimes several options within each level, Amazon can make it a bit difficult to pick the right category.

5.1.2 PRESENTATION OF SEARCH RESULTS

After narrowing down the selection, it is time to make a quick assessment of the remaining options. All sites provided a short summary of each search result entry, but the content and design of this summary varied. The most important goal for search listings is to enable users to quickly consider which content is worth further consideration. All the sites employed an approach where the listings included the title of each and some critical metadata. Neither of the sites allowed me to customize or hide the information that was presented, but they all let me order the results based on various criteria.

Booking.com (Figure 5-3) provided information about prices, availability, and user reviews, as well as the option to book the hotel immediately. This allowed me to quickly assess all the most important information. By displaying both the full price and the reduced price provided by Booking.com for the rooms, I could quickly consider how much value for money I could expect. As some rooms have heavily reduced prices, it can be worth noting this feature. Each search result featured several links, allowing me to go to the information page, the user
reviews page, to see a map, or to book the hotel directly. I did not find this to be confusing, even though there was four or more links to the information page in each search listing.

Amazon (Figure 5-4) had a similar approach, but was slightly sparser with the information provided. Again, pricing, availability and user reviews are available, but we do not get any more description of the book, meaning that we have to rely on the title. It is not relevant that a book is cheap and has many good reviews, if it is not covering the right topic. We could argue, however, that it is really the job of the publisher to provide a fitting title and cover. We do, however, receive information about used editions of the same book, as well as information on shipping.

LinkedIn (Figure 5-5) provided a summary, as well as information about the number of answers, who has asked the question, when it was asked, and in what category it was asked. This is pretty much all the information that can be expected when searching a Q&A service, and I found it to be adequate.
By providing search options and effective search result pages, all the sites made it easy to find content that could be assumed to be relevant. I did not find that any of the search listings were able to make me decide upon a specific entry, but they enabled me to pick a limited number of options for further studies (unless, of course, I was looking for a specific book or hotel).

5.2 RECOMMENDATIONS BY USERS

As was expected, all the sites had a lot of user generated content. While Booking.com limits this to user reviews for each hotel, Amazon and LinkedIn integrates user generated content in various ways. I will begin by explaining Booking.com’s basic implementation, and then explore how Amazon utilize its users’ behavior and contributions to help readers evaluate specific books, as well as find other relevant books. Finally, I will show how LinkedIn has created a completely user dominated information environment.

5.2.1 BOOKING.COM: USER REVIEWS, FILTERING AND AGGREGATION

Booking.com allows travelers who have booked a hotel using their service to post a short review about their experiences. These reviews contain five dimensions that can be graded from 0 to 10, as well as a short textual summary of positive and negatives sides. Reviewers are expected to provide a name, their country and city of residence, as well as stating what “kind” of traveler they are (i.e. young couple or solo traveler).

The average score and number of user reviews are displayed in the search listings, allowing me to quickly consider interesting hotels. Each hotel also has a dedicated page where more verbose aggregated information is available, as well as the individual reviews (Figure 5-6).
User reviews are subjective by nature, and I found some examples of contradicting information. Most hotels had very many reviews, however, meaning that the averaged scores should be quite robust with regards to single reviews deviating from the rest.

The scores are aggregated, enabling visitors to quickly see the total average, as well as the average for each of the five dimensions. When browsing hotels, I usually read the first couple of reviews, and unless I found any unsettling information, I did not bother reading more, assuming that I would not get much added value by doing so.

The option to filter scores based on the type of traveler is a very nice touch. Since it is likely that young couples, families with older children, and mature couples have differing needs and standards, this is very relevant.

The actual value of this functionality on Booking.com is probably limited, however. I did not do a thorough analysis of the range of average scores from different groups, but found that they mostly concurred within a range of 0.5 point (on a scale from 0 to 10). This means that they probably will not make much difference.

The fewer reviews a hotel had, the greater the discrepancy. For a hotel with 81 reviews, the grouped scores ranged from 3.5 to 7.6. The 3.5 review was from a group with only one reviewer, indicating that a low number of reviews may provide less accurate results.

Knowing which country visitors were from provided some useful information. For example, I found one slightly negative review complaining about the lack of tea facilities in the room. The review was made by a mature British couple, which might indicate that the severity of

this missing feature was given more weight than I would have given it myself. Automatically linking regional stereotypes to reviews is likely to be misleading, but regarded with some caution, this information can be relevant. Being able to filter based on country of origin might be a useful addition.

5.2.2 Amazon: Social Navigation and User Reviews

Similar to Booking.com, Amazon also provides user reviews. Amazon, however, places more emphasis on textual content. Reviewers can provide a title and a text, as well as a score from 1 to 5. The score is useful for quickly assessing the average opinion of a book among reviewers, as well as locating reviews to read (Figure 5-7). I found that most books had a fairly concurrent set of scores, with some deviators. When a book has fifty favorable reviews, and two unfavorable, it is interesting to see why the two reviewers did not like the book.

Amazon allows readers to vote for helpful and unhelpful reviews. Considering that some books can have hundreds, and even thousands, of reviews, this makes it easier to find relevant reviews. By default, the most helpful reviews are presented first. Reviews can also be commented, allowing users to further evaluate reviews. Furthermore, comments can be voted as “adding to the discussion” or not. When performing my scenarios, I did not see a need for this kind of nested meta-reviewing, but for certain books, it might be relevant.

Amazon utilizes data generated from users’ behavior to provide recommendations. Although somewhat embedded throughout the site, there are especially two interesting examples of this functionality, both present on the book information pages. They are labeled “Customers Who Bought This Item Also Bought” and “What Do Customers Ultimately Buy After Viewing This Item” (Figure 5-8). Both are useful for finding similar books, while I found the latter to
also be useful for evaluating the current book. If near 100% of users have bought the book in question, it is likely that it is the most relevant book within its topic. If many users have bought one of the other books, however, it might very well be worth considering that book instead.

![Figure 5-8: Recommendations on Amazon](image)

5.2.3 LinkedIn: Peer to Peer Business Advice

LinkedIn’s Answers service is completely user generated. Users can ask questions and receive answers from other users. This kind of service is certainly not unique, but LinkedIn has managed to create a service with very professionally oriented content. When looking for information, I can either search existing questions and answers, or ask a question. I found that asking questions was a good way to receive relevant answers.

By precisely formulating my problem, I will get information that is targeted at solving that specific problem. However, if a question is ambiguous, other users can misunderstand what I actually want to know. When asking questions myself, I found that some of the answerers had indeed misinterpreted my perspective.

Most information on LinkedIn is tied to a specific person, rather than generalized topics. If we compare this to Amazon’s user review service, Amazon provides all reviews which are related to a specific book, regardless of why I would want the book. On LinkedIn, I would ask a question like “Is <book name> suitable for a beginning web designer looking to get a kick start at CSS”. Rather than receiving information about the book in general, I would receive information about the book in a specific setting. This makes the information more relevant to that specific scenario.

When browsing answers, each answer is connected to the person who has provided the answer, with some key information about that person. This includes his full name, a short summary of his job, which categories he has provided best answers in, his relation to me, as
well as a link to his profile (Figure 5-9). This allows me to quickly assess his competence, to get more information about him, or even contact him directly. This also means that whatever he answers will be directly and easily linked to him. If he provides bad answers, it will reflect negatively on his profile.

In addition to easy assessment of answerers, LinkedIn also helps readers find the best answers. Unlike on Amazon, readers cannot vote for answers. Instead, LinkedIn allows the person who asked the question to select several good answers, as well as pick the best one. This approach makes sense, since the person asking the question is most likely to know which answers best solve his problem. It is also a nice way to let askers show appreciation towards their answerers.

When browsing answers, those that have been selected as good or best are shown first. Considering that some questions have over a hundred answers, and that there are no attributes attached to answers to allow sorting or filtering, this helps me find the most relevant information immediately.

5.3 Reputation and Authority: The Power of Profiles

I found that Booking.com’s review contents were so limited and structured that there was little room for poor contributions. There was little reason to distrust reviews, in part because only persons who have stayed at the hotels can make reviews, and in part simply because there is, as far as I can see, very little incentive for making poor reviews.

Amazon and LinkedIn, however, is a different story. Both services link reviews to profiles. Amazon ranks reviewers, and assigns “badges” to top reviewers, while LinkedIn is entirely built around profiles.
5.3.1 Amazon: Ranking and Badges

I found that Amazon had indeed have quite a few less useful contributions. The aforementioned system of meta-reviewing helps lessen the impact of poor contributions, and Amazon also audits all reviews and rejects those that do not follow their review guidelines. Compared to some other sites with user generated content, the overall quality of reviews on Amazon is good.

However, book reviews are subjective, and often contradicting. Although most books seem to be either generally favored or generally disfavored, some books have reviews evenly distributed across the scale. This raises the issue of deciding what reviews to trust. I found that the first course of action was to actually read the reviews. Reviewers were good at stating what they like or dislike, and sometimes a book received a bad score just because the book was not actually what the reviewer was looking for (i.e. too technical), and not because of any intrinsic qualities of the book. If reading reviews did not help clear the situation, I could turn to the authors of the reviews.

All reviewers are identified by name, and sometimes a “badge” too. In addition, we get to see when the review was written and how many users have found it helpful (Figure 5-10). As an infrequent user of the service, who has not paid much attention to author names before, I did not recognize any names. As far as I could tell, there were almost 3.5 million contributors. The majority of them have contributed one or two reviews, but their top 1000 reviewer had written 297 reviews, while the number one ranking reviewer had as many as 16256 reviews. What this indicates is that most reviewers will only appear very seldom, and that it is not much opportunity for recognizing names of reviewers. This is where the badges come in handy.

Badges are assigned to top reviewers, roughly indicating their rank. Rankings are based on number for helpful reviews, and not just sheer amount of reviews, meaning that persons looking for high rankings cannot just post many reviews; they also have to make reviews that are considered helpful by other users. Although surely not bulletproof, the badges are an effective way to give certain reviewers extra credibility, and thus also increased believability.

User profiles provide more information about the reviewer, including a short self-provided description and other reviews by that user. This can give some indication of the user’s expertise within the area. The profile pages do not make it easy to find specific information,

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14 http://www.amazon.com/review/guidelines/review-guidelines.html
15 http://www.amazon.com/review/top-reviewers.html?page=336655
like for example reviews of similar books. If comparing two books about the same topic, it could be relevant to also compare reviews by the same reviewer.

I found, however, that user profiles are not very emphasized on Amazon. The benefits of having many or few reviews are limited to the likeliness that others will notice you. This means that it is not really a problem to submit poor reviews, since the value of your reputation is so limited. However, by having this ranking system, I suppose several users can be motivated by rankings, and thus create many valuable reviews.

5.3.2 **LinkedIn: Profiles Front and Center**

On LinkedIn, everything is based around user profiles. I think the main reason for using LinkedIn is to build a professional network, and in order to connect to as many as possible and be viewed favorably you need to behave in a way that makes other people want to connect to you. By having an extensive profile page with many recommendations, you make yourself more attractive both as an expert within your field, and as a possible target for recruitment. I do not believe many LinkedIn users are actively looking for work, but that the service is more about building a reputation and a network, so that when time comes to get a new job, you have as many options as possible.

As already mentioned, authors are very visible when reading answers, helping users assess the competence of the answerer. Another important aspect is the motivation factor. As reputation building is one of the most important goals on LinkedIn, it is desirable to provide as many good answers as possible. By providing good answers, other users will be more likely to read your answers (since good answers are listed first), and more likely to notice your name in a favorable manner. Furthermore, for each question where your answer is picked as the best answer, you receive an experience point within that category. This expertise is listed next to every answer you make, and is also featured on your profile page (Figure 5-11).

![FIGURE 5-11: EXPERTISE ON LINKEDIN](image-url)
6 DISCUSSION

During my studies I have found many aspects of data quality and user interaction. In the previous chapter I highlighted search, user contributions and profiles. In this chapter I will discuss these findings, centered on two topics: decision making and reputation management.

In subchapter 6.1 I will discuss how decisions are made and the basis for those decisions. I subchapter 6.2 I will discuss the role of reputation management, related to making decisions, and for ensuring that the basis for decision making is as good as possible. This subchapter will also revisit some of the theories from media studies, and see how that they help us understand the mechanisms of reputation on the Web.

6.1 DECISION MAKING ON THE WORLD WIDE WEB

A very common application of knowledge is decision making. We seek out and try to understand information, so that we can use the accumulated knowledge to guide us in our lives. I would argue that all information will at some point be used for making decisions, but during my study, I have realized that there is a difference between seeking information with the purpose of making a decision about an identified problem, and seeking information in order to be able make a decision about an as of yet unidentified problem.

I found that on Amazon and Booking.com I sought information to solve the problem of deciding which book or hotel to choose. For LinkedIn, however, I only sought to find as much information as possible about a topic. I had no clear idea as to how that information would be applied.

Having an identified problem to solve (which requires a decision to be made), affected the way I searched for information. When performing the scenarios for Amazon and Booking.com, I continually considered whether I needed more information in order to make a decision. This brings to mind Simon’s model of bounded rationality (Simon 1979). I experienced this while searching for books/hotels, and on the dedicated information pages.

When searching for books to consider, the omniscient approach would have been to consider every single book on the site (and all other sites). Even when searching for a specific term like “search engine optimization” on Amazon, I still had over 800 books to choose from. If I was going to make sure I picked the right one, I would have to both consider the brief summary of all the books, as well as actually read the in-depth information provided for each. As Amazon is kind enough to provide me with the option to let me decide for myself how I want the results displayed (as recommended by Morville and Rosenfeld (Morville and Rosenfeld 2006)), I can choose to first see the most relevant, bestselling, most recent, or most favorable
user reviews. I never actually considered viewing all the books, but rather picked the first few that seemed good enough, I \textit{satisficed}, and then sought out their reviews.

One of the books had exactly one hundred reviews. As my goal was to consider the appropriateness of that book for my given purpose, I did not have to read all the reviews before I was \textit{satisficed}. Once I had read a few favorable reviews and the very few unfavorable, I did not believe that my opinion would change significantly by reading more reviews.

During the same scenario, however, I also found a book with fewer reviews, but those were similarly favorable as the ones for the other book. Now I had two apparently equal books. There was no information available that could rationally tip the scales in any direction. Nevertheless, if I should have actually bought one of the books, I would probably choose the latter, based on it having a slightly more pleasing cover, and that the first book was in the “For Dummies”-series, which I have a little problem identifying with (I do not consider myself to be a dummy).

This decision is no longer based on rationality, but rather on the emotions I associated with the two books. This reasoning can best be explained using Norman’s theories of emotional decision making (Norman 2004). Even while reviewing the first search results on Amazon, I had a slightly negative feeling about the “For Dummies”-book, but since I tried to be as structured and objective as possible during my analysis, I decided to ignore that hunch and rather consider the more rationally relevant factors. As I read through several reviews, I got more convinced that both books were perfectly valid, and probably very much capable of satisfying my needs. Rationally, I could not decide which book was best, while it was quite easy to leave rationality behind and choose the book that I felt most strongly for.

This interplay between bounded rationality and emotional decision making was also experienced in the “Find a hotel to book in Barcelona”-scenario, where I had an abundance of hotels with several hundred reviews to choose from. I could have made a thorough study, analyzing each and every hotel, considering prices, location, standard and user reviews. If I did, however, it would probably take several days. Rather, I narrowed my decision based on certain already present parameters, like wanting a cheap hotel. Given a list of seemingly similar hotels, I would choose the cheaper. Thanks to the fact that Booking.com requires its reviewers to supply numeric scores along different criteria, the main content of reviews could be aggregated to give a concise representation, allowing me to easily get an overall impression of the quality of each hotel. Still, I found that it was difficult to make a decision based only on the available facts, requiring me to resort to my gut feeling. The pictures provided by each hotel helped me make this emotional decision.
What both these scenarios illustrate is that having an abundance of information does not automatically facilitate efficient decision making. In tradition with Herbert Simon, we make decisions that *satisfice*; although we may not have studied and considered every possible option, we know enough based on our current needs to not need to find more information. However, even though we arrive at a point where we do not need more information, we may still not be able to make a final decision. If the information we obtain only serves to make the remaining options seem equally good, we need to rely on our emotions to properly decide.

It should be noted that I do not believe emotions would help me decide on their own. Rational evaluation was required to limit the number of options. The theory of omniscient rationality, however, was not relevant.

6.1.1 ABOUT THE BASIS FOR MAKING DECISIONS

In addition to consider how decisions are made, we should consider what these decisions are based on. Whether we look for all possible options, or just enough to satisfice, we need to study how we find the information that is most relevant, and what the attributes of that information are. During my cases, I studied both aspects.

My analysis of the information was based on a model where data quality issues were divided into four categories, each with several dimensions. Although the relevance of each dimension varied for my scenarios, the model was generally helpful. I became aware of many potential issues, which allowed me to convincingly examine the sites further. By evaluating how each issue was handled, I made many interesting findings.

I found that user generated content was valuable. Although all the sites I studied had contradicting contributions, I found that differing views gave me a more complete understanding. Especially Amazon did a very good job at categorizing contributions based on favorability of reviews. This was combined with the option of voting for each individual review as well, allowing users to quickly find the most helpful reviews. I think this organization of information helped me *satisfice* long before I had read all the available information.

The main issue I found with user generated content was of a contextual nature. This was most evident on Amazon, where quite a few reviews did not actually review the content of the book, but rather its author or the delivery. The option for users to vote for helpful reviews helps users find the most relevant reviews first, but there is nevertheless a potential problem that some valuable information can be harder to find.
A slightly surprising observation was that I found very little content that did not in some way contribute positively. My experience with many other sites relying on user generated content is that there can be issues related to immature contributions, spam, and flame wars. This was not evident on any of the sites I studied.

Amazon has established guidelines and seems to manually audit every review. On Booking.com I did not find any way to write reviews, so I would suspect that after booking a hotel, and having stayed, users are invited to contribute reviews. This limits the easy of contributing, which probably makes it less attractive for abuse. I do not know if Booking.com audits contributions.

On LinkedIn contributions are immediately published. There is the option of reporting suspicious questions and answers, which might be both preventive and reactive. However, I rather believe that it is LinkedIn's professional focus and strong link to user profiles that help LinkedIn receive quality contributions. Users are less likely to make contributions that will affect them negatively later on.

6.2 Reputation Management

I found that reputation management was incorporated in varying degrees on all the sites. Reputation can be considered on several levels, ranging from the reputation of a single person, to the reputation of corporations, nationalities, age groups, or the sexes. An isolated statement can take on significantly different meaning depending who makes it.

Even the type of information may be bound to reputation. Knowledge management theorists have argued that “decision makers [favor] explicit knowledge, at the expense of contradictory tacit knowledge, because it may be viewed as more legitimizied and, hence, justifiable” (Alavi and Leidner 2001).

Two possible aspects of reputation are creation and use. When a person writes something, she builds or creates a reputation. When a person reads something, he uses the reputation of the author to assess whether the information is reliable. This implies that in order to assess the reliability of an author, that author first has to build a reputation. Web site developers need to enable its visitors to assess the reputation of a contributor, as well as allow contributors to build reputations.

The presence of reputation management mechanisms can also motivate users to contribute content, and to make sure that that content is of good quality. When users are linked to the content they write, the content affects their reputation. It is generally assumed that people prefer having a good reputation, and that people are less likely to perform actions that will
have negative consequences. The mere option of having your reputation assessed may also inspire users to produce content. If you want to be noticed in a community, you need to be seen as a valuable contributor. As Strong et al. argues, contributions with a poor reputation can be “viewed as having little added value [...] resulting in reduced use” (Strong, Lee and Wang 1997).

Linking content to user profiles can provide several benefits. First of all, by linking content to a user, someone can be identified as an author. Most critical readers will at least be slightly interested in knowing who has written a text. Authorship can be linked to authority, and in a digitalized world, where large amounts of content is growing more and more available, authority helps readers assess the value of a text. If you trust the author, you also trust what he writes.

A fundamental aspect of sites powered by user generated content is the number of contributing users. This means that it is harder for readers to evaluate authors. Established publishers like The New York Times and BBC can guarantee quality through their brand, thus allowing users to trust the content they provide. On the other hand, users are not likely to blindly trust user submitted reviews on Amazon. In fact, Amazon provides both editorial content and user reviews. Editorial reviews can receive increased trust, due to the brands attached to them.

Linking content and contributors is the first step towards establishing believability. By allowing one contributor to produce several content items under the same name, readers can start to recognize that name. On a web site with thousands of contributors and possibly millions of articles, it can become almost impossible for one user to provide enough content to be recognized. After all, how often do you even care who has written an article in a newspaper? I would think that author awareness may be somewhat higher when the site does not provide a “mark of approval”, meaning that it might be easier to be recognized as reliable in an environment where users expect unreliability.

As we have seen, Amazon uses badges to give certain contributors more prominence. The three most relevant badges are “Top 1/10/100/500 reviewer”, “Real Name™” and “The <famous person>“. The first badge is based on a ranking of the number of useful votes a reviewer has received. The top ten reviewers on Amazon have provided from 2,262 to 16,186 reviews each, and the top listing has received almost 100,000 useful votes. The Real Name™ badge simple indicates that the contributor uses his real name. Although not really a guarantee for quality, it does mean the person is likely to take some care to not contribute content that might harm his or hers real world reputation. The “The” badge promises to identify celebrities, and is certainly helpful for utilizing reputation for someone who has
already achieved fame outside of Amazon. However, I found this feature to be somewhat limited, as I did not find a way to search for people with this badge, and after doing searches for a few people who would have deserved that badge, I found it to not be applied.

I believe that the badge system promises to be quite useful. One possible shortcoming is the “generalized” nature of the badges. It aims to identify reliable sources for all kinds of products. With this, I mean that it will apply the badges regardless of the books being reviewed. It is quite possible that I will see a badge attached to a famous person doing a review of a book that is in a completely differing domain, or that a “Top 100” reviewer has earned her fame reviewing children’s books, but also has provided a few non-fiction reviews, or even that all the reviews are for DVDs and kitchen appliances. The contextual relevance of badges is not dealt with.

LinkedIn addresses this specific issue. On their Q&A service, all contributions are attached with the position of the contributor (i.e. “Senior Web Developer at <company name>”) and a list of domains where that user has provided Best Answers. This provides significant contextual relevance.

Furthermore, profiles on LinkedIn are more like professional resumes, providing information about current and previous places of work, education, experience and recommendations. Compared to Amazon (and many other services) this amount of information is quite impressive, and certainly helps readers assess whether the contributor is qualified to answer.

LinkedIn is a service aiming to link professionals, and recruitment is an important part of this. Unlike on Amazon, where it is quite possible to provide bad reviews, but still very possible to buy books, poor contributions on LinkedIn are directly detrimental to a user’s value of the service. More importantly, perhaps, high quality contributions are more likely to make people notice you and want to contact or hire you. LinkedIn is designed around profiles, which is an effective way of encouraging quality.

6.2.1 DO READERS CARE ABOUT REPUTATION?

Although focusing on reputation seems to help increase the quality of content, a valid question is whether reputation matters when users are browsing content. While performing my scenarios, I found that I seldom considered the author of contributions. This can be due to the kind of information I was looking for. When browsing for books or hotels, I never considered that information in reviews could be plain wrong, or less reliable. I did, however, slightly consider the reviewer of books. If the reviewer complained that the book was not suited for non-technical people (and therefore gave it a poor grade), I would consider that review to be less relevant, since I am a technical person. In a similar vein, I expect that a
Democrat reading a review by a Republican is likely to interpret the content differently than if the review were written by a fellow Democrat.

These kinds of considerations do not actually relate to the reputation of the reviewers, but rather a bias they may hold. A useful feature might have been to allow users to enter their political preference, and then only see reviews provided by people with the same political background. This would increase the relevance of information presented, although at the same time limiting the completeness aspect.

When looking for information and asking questions on LinkedIn, I also did not really consider the persons contributing information. I read the text, and made a personal assessment of the value of that answer. I did not find many contradicting answers, only answers with differing perspectives or focus. This means that I did not need to consider whether an answer was right or wrong, only whether I found it useful or not. I would suspect that certain questions might provide more opposing answers, requiring me to decide which source to trust.

6.2.2 Revisiting McLuhan’s Global Villages

Although McLuhan ceased writing long before the onset of the World Wide Web, his idea of the electronic culture as a global village, where users participate in a tribal-like fashion can also be applied for understanding the Web. More than any medium before it, the Web allows sensory plenitude, connectivity and simultaneousness. Everyone can virtually communicate with everyone. If we consider McLuhan’s extended understanding of media and technology, where he does not limit media to signify the more established mass media like newspapers and radio, but rather consider both media and other technology to be extensions of man and the human sensorium, we can understand the Web as a marketplace, a gossip arena, and many other functions of the analog world.

Resnick et al. (Resnick, et al. 2000) have shown reputation as a means of assessing trust, which have previously been based on person-to-person gossip or relayed through mass media. Although they argue that the similarities between traditional markets and online reputation systems do not go beyond aggregation of large amounts of information, and that today’s reputation system should not work in theory, they also note that they do in fact work. I think their theory-based conclusion might benefit from analyzing the reputation systems from a different perspective. If we consider contributions on the Web to be a remediation of contributions in a civilized analog society, we have a much wider range of factors to consider.

Resnick et al. argues that vendors should be expected to develop ways to manipulate and trick the system. Although this is true, this is also not any different from the real world. There
are countless examples of misconduct by dishonest vendors, but the risk of getting caught often outweighs the benefits. I would believe that the highly competitive nature of the Web, where users can easily switch supplier, makes it even less attractive to cheat. Although the act of cheating may be easier (given the possible anonymity of the Web), the dangers are even greater. Since all interaction is stored digitally, it can be analyzed digitally as well. This makes it easier to discover cheating. On a related note, there are potentially many more users on the Web whom can work together to track down cheaters. Unlike in the analog world, where users seldom leave information for other users to find, the Web makes it very easy to contribute opinions. As Eric S. Raymond has said, “given enough eyeballs, all bugs are shallow” (Raymond 1999). Although aimed at software development, the principle that the more people who scrutinize something, the more likely it is that errors will be spotted is just as valid in many other situations.

By considering the Web to be a remediation of interaction in the analog world, it is easier to understand the principles guiding its development, since we can base it on already existing theory. I believe that Raymond Williams would probably agree to this notion, as he would argue that the way reputation systems have developed is determined by human’s already present intentions and agency. They only further the already present social structures (Lister, et al. 2003), where trust and authority is well established.

The newness of the Web is more related to the number of publishers and the converging importance of traditional media houses and individual users, as well as the globalized centralization. All the sites I have studied simulate or remediate functions already present in the analog world.

Booking.com is a travel agency. McLuhan would argue that the properties of the Web has changed society, since it has enabled users to be their own agents, finding hotels and deals without the help of human intermediaries. The content of a hotel booking process is the same as before. We consult “friends” and magazines to get recommendations, search for best prices and make a reservation, but unlike before, all those tasks are performed online in a self-serving environment. Furthermore, the medium allows more content to be easily available, resulting in increased competition (and thus lower prices) and increased transparency, since all recommendations are aggregated and made visible. Where bad performance of a hotel previously only spread to the limited network of friends of the guests experiencing the problems, those experiences are now shared with everyone, meaning that the impact of bad performance is multiplied. I would expect hotels on Booking.com with a less than average score to receive very few bookings. Unlike McLuhan, Williams would argue that the way increased competition and transparency has been made available is only a consequence of
society’s desire for such mechanisms. The fact that the mechanisms are so similar to the analog world, gives merit to this notion.

The same “fight” between technological and sociological determinism can be found in the example of Amazon. Whether it is humans’ desire for a coherent source of supplies and information, or the globalizing and efficiency attributes of the digital environment the Web provides that has been key to their success, the consequence is that the whole world can go to one single Web site to both read reviews, get recommendations and purchase a wide variety of products. All the services are converging towards one source. One advantage of this process is the increased collective intelligence of the service. Amazon owns much of its success to the fact that so many people are using it. With 3,5 million reviewers, it is actually no wonder that almost every book has several reviews.

LinkedIn, perhaps even more than the other two sites, is really an online village. The service is based on human-to-human interactions, where good behavior is regarded favorably, and most of your actions will affect your future in the community.

6.2.3 REPUTATION AS SOCIAL CAPITAL

Picking up on the notion of good behavior, I would like to finish this discussion by returning briefly to the focus of the MOSCITO project, social capital. As social capital is often considered to be a resource that can be capitalized on and thus encourage favorable behavior, this can be seen in relation to reputation. Whether reputation is an aspect of social capital, or if it is actually the other way around, is beyond the scope of this thesis. What I want to introduce is simply the possible connection between the two.

I believe having a good reputation will increase the likelihood of others to treat you favorably. LinkedIn is all about building reputation, either as a potential employee, or as a person who is kind and provides good answers, and thus deserves to receive good answers to his own question. Given these two applications, I would consider social capital to be the measuring device of reputation. The amount of social capital you have is a direct consequence of your reputation.
7 CONCLUSION

Throughout my study, I have tried to understand what makes successful Web sites successful. By focusing on sites with extensive amounts of user generated contents applied in a commercial setting, I have studied the quality and presentation of the content. Drawing on theory from several academic fields, I have sought to achieve a broad understanding of both how the sites work, why they work, and what we can learn from that information. Acknowledging that the individual fields may be too narrow in their focus, or rather that the Web is indeed a web of entangled phenomena, the multidisciplinary approach has lead me to identify two main topics: decision making and reputation management.

Decision making is emphasized because information and knowledge is still the dominating content of the Web, and, as I have argued, the most common application of information is to make decisions. I have only studied a very limited domain of decisions, but have nevertheless found that both organization systems and user interaction can be better understood by considering the decision making they seek to enable.

Reputation has been central mostly due to the fact that the Web allows such immense freedom of expression. Freed from the strongly edited bounds of traditional publishers, millions of users are creating new articles every day. With almost no barriers to entry, the probability of poor quality content is high, which in turn makes it harder to find reliable information. Reputation has always been important in the civilized society, and as I have argued, systems for managing reputation can help both creation and retrieval of high quality content. In a media environment where anonymity is more accessible than ever before, real identities can perhaps become the most requested asset.

What I hope my study can provide is an appreciation of a multidisciplinary approach for increased understanding of how decision making and reputation can help Web sites generate high quality content and make it easily accessible for users. While my study may not be as deep as it would have been if I had restricted myself to just one discipline, I believe the combination of disciplines provides a more complete understanding. As I am of a pragmatic nature, my goal has been to find the theories that contribute most to solving the problem. Instead of being locked to one discipline, or even one specific theory within that discipline, I prefer to focus on applications and use different theories to understand the implication of design choices.

While my findings will probably be most useful for developers of Web based services, they can also form the ground for further studies of reputation and decision making. My study has been confined to a limited subset of Web sites and information retrieval goals. A different,
but decidedly interesting, perspective would be to focus on blogs as a basis for making the decisions, and how reputation is managed and utilized in the so called blogosphere.

Another question, related to Q&A services like LinkedIn, is how my own reputation can affect the response I get. Can building a strong reputation also give me social capital to warrant increased quality and number of answers? What is the relationship between reputation and social capital?
8 BIBLIOGRAPHY


Appendix A  RECOMMENDATIONS

During the process of performing scenarios, evaluating data quality and doing a heuristic evaluation, I made many observations. Through analyzing and systemizing my findings, I made a list of recommendations for developing websites. They are provided here for reference, but their potential value has not been assessed. I believe they can be used a basis for further studies, or be useful for developers of Web sites.

DATA QUALITY RECOMMENDATIONS

INTRINSIC DATA QUALITY

1. Being upfront about the author of a text strengthens the believability of a source.
2. If you structure information into factual chunks, you minimize the risk of biased content.
3. Connecting reviews to the type of reviewer can provide more relevant results.
4. Few reviews may provide less reliable statistics.
5. Textual comments can make discrepant reviews more useful.
6. Providing information about the place of origin of reviewers can help explain why they have written what they have.
7. Dividing scores across several dimensions can make it easier to base your decision on the right parameters.
8. By placing great emphasis on profiles, you encourage users to only perform actions that will be positive for their reputation.
9. Deploying services based on user generated content in a strictly professional context can help eliminate spam and abuse.
10. Encouraging users to link to external resources can help scanning without sacrificing depth.
11. Making user information immediately visible can make it easier to assess the expertise of the user.
12. Allowing the person asking a question to pick good answers ensures that the most relevant answers are highlighted.
13. Providing a way to identify expertise can encourage users to contribute high quality content, and also makes it easier to find high quality content.
14. Allowing users to report inappropriate content can help prevent and remove spam and abuse.
15. Linking content to profiles can provide relevant background information, helping users assess the validity of a review.
16. Linking content to profiles allows for reputation building. Introducing a reputation element can encourage users to contribute high quality content.

17. Using badges to provide extra information about a reviewer can help users decide which reviews to trust.

18. Allowing users to vote for content as helpful/not helpful or good/bad can help users find relevant content to read.

19. Allowing users to comment reviews can help other users better understand the meaning of a review.

**Contextual Data Quality**

1. Information that can be aggregated is well suited to large datasets.
2. Linking temporal information in reviews to actual events can make reviews more relevant.
3. Combining factual information with user generated content can provide balanced and comprehensive information.
4. Metadata makes it easier for users to find the most relevant information from a large body of data.
5. Allowing users to vote for content as helpful/not helpful or good/bad can help users ignore off topic reviews.
6. If a review is linked to different versions of the same product, differences between products should be noted.
7. If reviews are closely linked to time they were produced, this information should be easily available. Users should be allowed to sort reviews by date, and preferably have information available regarding important events which affect the relevance of the review.
8. Combining filtering and sorting can help users quickly find the most relevant information.
9. Allowing users to ask question can help make the information contextually relevant.
10. Highly subjective information can reduce the general usefulness of a service.

**Representational Data Quality**

1. Using plain language ensures that users are able to interpret the meaning of your content.
2. Providing users with information written in their own language first makes it easier to find useful information.
3. Allowing users to enter information in the native language helps generate larger amounts of data.
HEURISTIC EVALUATION RECOMMENDATIONS

1. The heuristic evaluation illuminated several useful aspects:
2. A global branding helps the user know what site he is on.
3. Breadcrumbs are useful for helping the user orientate himself in the site hierarchy.
4. Creating sites with a flexible width allows users to take advantage of large monitors.
   By providing a max width, designers can ensure that the width will not be so large that is hard to use.
5. Keeping search criteria available on search result pages makes it easier to adjust the search.
6. Providing filters makes it easier for users to focus a broad search and make the results more relevant. Indicating amount of hits with available if a filter is applied makes it easier to decide whether to apply it or not.
7. Consistent use of link titles and pages titles makes it easier for users to understand the interaction.
8. Following established conventions for linking makes it easier for users to understand how the site works.
9. Breaking your own linking conventions can confuse users.
10. Unless there is clear distinction between links and other content, users can be confused. Contrast can include color, font weight and underlining.
11. If you are designing your own version of common interface elements, it’s important to make them easily understandable.
12. Providing users with suggestions of possible search terms helps users search for the right information. An iterative feature based on the first few letters entered, with an indication of how many results that search will provide works well.
13. If normal navigation on the site produces URLs with information that is not suited for bookmarking or linking, friendly URLs should be provided.
14. If there are distinct types of information that can searched for using the same interface, providing search modifiers can help users find the information they are looking for more quickly.
15. Hiding extra information behind “more info” links helps provide a clean interface, and easy access to more information when required.
16. Dropping labels when they are not required helps clean up the interface. If it is obvious what something means, there is no need to label it.
17. Clear and concise language is more efficient and conveying information.
18. By stripping away extra features and irrelevant information, you make it easier for users to complete their current tasks.
19. When errors are encountered, clear error messages helps users get back on track.
20. Search result pages should always include the term the user searched for, even though it provided no results.
21. Making a difference between misspellings and simply no results helps users understand the process. If the term searched for is known by the system, users should be presented with options to broaden the search to produce more results. If the system does not know the word, it should state this clearly, and preferably provide suggestions of similar terms. Basic spell checking makes it easier for users.
22. Providing inline help messages helps users understand the system.
23. Use common icons or conventions to show that help is available. Pop ups and overlays can make help available without cluttering the interface or distracting the user.
24. When dealing with currency, providing easy means to convert the currency to the user’s local currency makes it easier for the user to understand the prices. This converter should remember the user’s preferred destination currency, and use the same source currency and amount that is available on the page.
25. If you provide many options on the same page, their relative importance should be made clear through the design.
26. When a search retrieves no results, you should help users get back on track. Informative messages should be easily available.
27. Listing recent items or pages viewed can help users backtrack.
28. Providing shortcuts to often used features allows users to quickly accomplish their tasks.
29. Providing too much information and features on one page can make it harder for users to find what they are looking for.