

Presence of Resilience, Self-Organization and Hierarchy in Web 2.0

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Abstract. With over 2 billion internet users [1] logging in more than 142,460,000,000 hours per month online [2], the web has become an integral part of life today. Possible employers look at profiles on Facebook and LinkedIn to judge potential employees. Wikipedia has become the ultimate source for information. Society communicates through the web. And, all websites can be considered systems as they have different elements that interact with one another, with the method of interaction defining the function of the website. Elements on the website can be users or the various parts of the website. The three characteristics that make systems function well, according to the author of 'Thinking in Systems' Donella Meadows, are resilience, self-organization, and hierarchy. These characteristics do not have to be present in an entity for it to be considered a system, but the presence of these characteristics almost always makes the system function better. Websites are systems, and due to the fact that the three characteristics cause systems to function better, it is likely that these traits are at least somewhat present in popular websites. This paper applies the three characteristics to Web 2.0 sites, and through analysis, finds that the presence of each characteristic is dependent on the nature, or function, of the website.

Keywords: Web 2.0, system, resilience, self-organization, hierarchy

1. Introduction

Online media has become an integral part of life today. People socialize, play games, shop, work, and, communicate online. Facebook pages are created for babies; Google is used to find information; email is used to communicate and, music is accessed and bought online. Families no longer sit together to watch what is playing live on the television. In short, entertainment is now online, under the user's control and collaborative. And, all websites are systems. A system is a group of elements organized in a specific manner that interact with each other to function as a whole [3]. Examples of a system include a body, a car, a forest and a city. Elements of the city could be the various municipal government organizations, such as the Department of Water & Power, the Department of Transportation and the Police Department. The three characteristics that make systems work well are self-organization, hierarchy and resilience [4]. Through observation of popular user-based websites, we will prove that these three characteristics are present in the social media websites. First, however, we must understand the three characteristics.

2. Hierarchy, Self-Organization and Resilience

These are the three characteristics defined by influential systems thinker Donella Meadows that make systems function well. A system does not necessarily have any of these characteristics. To be able to function well, the system must be fairly efficient. If a system is to function for an extended period of time, it must be fairly resilient, somewhat organized, and must have the ability to grow or diversify. The presence of resilience, hierarchy and self-organization in a system help the system to function effectively.

2.1. Hierarchy

A hierarchy involves ranking. Systems can be hierarchical such as in a company, where individual employees in various departments report directors who report to vice presidents reporting to the CEO. Most websites discussed in this paper are user-to-user and not all-encompassing hierarchies. A hierarchy is beneficial to a system because it allows for organization implying things are less likely to fail. Hierarchy also increases efficiency as each person or subsystem performs a different job. The presence of a hierarchy tends to increase the resilience of a system as if one element or subsystem fails, it can be replaced by another or

repaired. Hierarchical systems can be seen in parent-child relationships as well as in the food chain in nature. A hierarchy can be a form of self-organization if elements in a system organize themselves in a hierarchical way.

2.2. Self-Organization

Self-organization is the ability of a system to organize itself and allows systems to learn, diversify, become more complex and change. It can be seen in animals becoming a pack, when a riot starts, when a company is founded and when evolution occurs. Self-organization happens when a system organizes itself and works towards or maintains a goal hence hierarchy and self-organization do not conflict. In a company, for example, while there is a hierarchy, because everyone in the chain is part of the company, the system is organizing itself.

2.3. Resilience

A system's resilience is its ability to bounce back after a major change. A child therefore is resilient while a glass is not. Resilience allows systems to recover and exist in a changing environment. Sometimes, by reducing the factors that could damage or push against the system, the system becomes more resilient. An example of self-organization and resilience together is when a change is made on a website that slows down, hampers or gets in the way of use, and users do not like the change. The user community will often organize in groups voicing their opinions through various media.

3. Websites

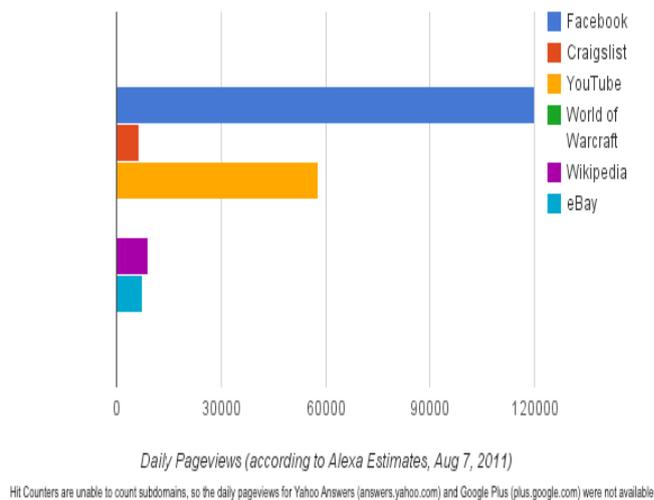


Fig. 1: Daily Page Views of various Websites

Websites were selected based on their having three major factors which were selected to make the analysis as accurate and understandable as possible. The first factor is a large user base which for the purpose of this paper means receiving more than 150,000 daily page views. Page Views are shown in Fig. 1. A large user based provides greater accuracy in the data and trends and has greater likelihood of the reader having used or heard of the site. The second factor is that most interaction on the website be user-to-user such as on a social network. Only websites with user-to-user interactions are considered for ease of analysis using systems thinking since this provides a greater number of interacting systems elements for analysis. The third factor is that the presence of those who run the website such as administrators must not be felt when users are interacting. Various websites are discussed in the rest of this section.

3.1. Facebook

Facebook is a social network on which users can invite people to events, join groups, share pictures and videos, and keep in touch with friends. Facebook is an interesting case due to its apparent lack of user hierarchy. There are small hierarchies within parts of Facebook such as elevated status through scores if games are played. However, as far as we can determine, there is no whole-site or inert hierarchy built into Facebook. Self-organization on Facebook is a different story. When users join, they are urged to enter their academic and work affiliations hence organizing themselves into groups. Self-organization also comes into

play when inviting friends to join Facebook who in turn invite their friends - recursively. Users also self-organize through "like" pages and by joining "groups" with a common interest or opinion. Resilience is present on Facebook because there is not much that could prevent the users from achieving the goal of the system of 'simulating the experience of being at a social gathering'.

3.2. Google Plus

Google Plus is a recently launched social network similar to Facebook and created and run by Google Inc. Possibly due to the fact that both are primarily social networks, Google Plus and Facebook are very similar regarding the three factors. Like Facebook, Google Plus lacks a major hierarchy possibly even less than was minimally present on Facebook. At its current stage, the only discernible possible hierarchy would be is a user chooses to "follow" another user to receive updates. Self-organization, as on Facebook, is more significant and arguably more present on Google Plus. When a user joins, they are encouraged to enter their affiliation as well as their interests and current and previous places of residence thereby organizing into groups. When a user adds another user to their groups, the adder must place the added user into a group. Groups are independent to each user, and are private from everyone excepting the user that created them. Users can create non-preset groups as well which is a very direct form of self-organization. User can also select interests, or "sparks", about which they can receive news and share news with friends. As with Facebook, resilience is present simply due to the fact that there is little that could prevent the Google Plus system from achieving its goal.

3.3. Craigslist

Craigslist is the online equivalent of classified advertisements for free and in 2008 was valued at 5 billion dollars. It has sections for employment opportunities, groups, sales, services, personal advertisements and others. Resilience is fairly present on Craigslist; if we consider the goal of Craigslist to be "enabling users to connect with others for mutual benefit". There could be situations that could push against this goal such as a post that is unanswered or when a user responds to posts inappropriately or hatefully both of which can be handled in Craigslist making it fairly resilient. Relative to the amount of self-organization needed, there is a very large presence of self-organization on Craigslist. However, in total, self-organization is only somewhat present on Craigslist. There is almost no control or regulation carried out by the people that run the website, which contributes to the self-organization: when an advertisement is posted, it is placed in a category by the poster. If another user believes that the post is in the wrong category, they will suggest that it be transferred to the correct category. Hierarchy is not noticeably present in Craigslist; the human interaction equivalent of Craigslist is a market in which stalls are set up and there are no set stores, where people offer various goods and services. In a market, there is no hierarchy; there are only individual vendors and people. Similarly, in Craigslist, there is no hierarchy, because all users are equal.

3.4. YouTube

YouTube is a video-sharing website acquired by Google in late 2006 for 1.65 billion dollars. It is the third most visited website on the web [5] and has over one hundred million users. Users can add friends, watch and upload videos, "subscribe" to a channel and comment on videos. Hierarchy is very present on YouTube. Depending on how many total views and how many subscribers a user has, other users may or may not follow them. Users try to receive as many views as possible, and some channels with many views and subscribers actually have employees working on the project full time. With the goal of YouTube being to "provide a medium for users to upload, share and watch videos", it is usually resilient except when (i) a change is made to YouTube that users do not like causing them to join groups and commenting to remove the video and (ii) a video is taken down; another user will put the video back up, thus bouncing back. Self-organization is fairly present on YouTube. If users dislike a change to YouTube, they will come together and try to have the administrators remove the change.

3.5. World of Warcraft

World of Warcraft is a massively multiplayer online role playing game, meaning a very large number of players play in the same virtual location. It has over 11 million subscribers and is paid for on a subscription basis. Players play by creating an avatar, a character they control and can trade, fight, complete "quests" and interact with others to gain new abilities and talents. Players can join guilds, which are essentially groups of players that may know each other or have similar attributes. Hierarchy is very present on World of Warcraft with a ranking system being the most significant. Players are assigned a level based on the length, time and

skill of play. Certain guilds are also more powerful than others. In certain cases, there may be a leader of a group of players. Self-organization is somewhat present on World of Warcraft; users can organize themselves into guilds and clans. There are fictional 'species' on the game by which characters are organized as well. Resilience is difficult to determine due to an unclear sense of the goal of the World of Warcraft system. If we consider the goal of the system to be "simulation of living in a fictional world", the system is very resilient because there is little that could prevent that. If we consider the goal to be "enjoyment of simulated fictional existence", the system is somewhat resilient, because certain users may not enjoy the game and may simply leave. In reality, the goal of the system is most likely a mixture of these, so the system is fairly resilient.

3.6. Yahoo Answers

Yahoo Answers is user-driven question-and-answer website created and run by Yahoo. Users can ask as well as answer questions from other users. It is the second most popular question-and-answer website on the Internet. Hierarchy is very present on Yahoo Answers. Based on the quantity and quality of answers, users are given points and placed in levels. Self-organization is fairly present on Yahoo Answers. Both askers and answerers of questions can categorize a question. If an answer is wrong or inappropriate, both the asker and other users can mark the answer as bad. If an answer is correct and/or helpful, both the asker and other users can give the answer a rating that would show other users that the answer is good. Resilience is fairly present. With the goal of Yahoo Answers being to provide correct answers to questions, if an answer is wrong, hurtful or spam, other users can give the comment a thumbs down. The answer cannot, however be removed by anyone except the original poster.

3.7. eBay

eBay is a consumer-to-consumer selling platform established in 1995 and is valued at 35 billion dollars. Users can either auction items or choose to allow the purchaser to buy the product immediately. Hierarchy is fairly present on eBay. Buyers and sellers are rated and those that receive higher ratings will be trusted more and will thus have better and more transactions. eBay is somewhat self-organizing; the only major self-organization present is the same situation that demonstrates resilience in eBay with the system organizing itself to correct any unfair or wrong sellers. We can consider eBay's goal to be "allowing users to buy and sell products safely and fairly, and without vendors". eBay is fairly resilient, partly due to the fact that when the system is not resilient, buyers or sellers might lose money giving the other user a low rating indicating that the buyer or seller is not to be trusted. After an unfair purchase or sale, the system "bounces back" and warns of this buyer or seller.

3.8. Wikipedia

Wikipedia is a collaborative online encyclopedia valued at 7 billion dollars [5], and is the seventh most visited site on the Internet [6]. It is a public, free encyclopedia in which every page is a wiki. Hierarchy is somewhat present in Wikipedia. Administrators are at the highest level and have accounts that allow them to regulate and create Wikipedia pages using tools that others may not be able to access and ban specific users and computers from posting on Wikipedia. Next in the hierarchy are users with accounts with privileged editing capabilities and the right to request administrators to ban certain users. At the lowest level are anonymous users. Self-organization comes into play when something wrong or unnecessary is posted. Other users, administrators or users with accounts correct or delete it. The same situation is a good example of the system's resilience. When something bad or unnecessary is posted, the system "bounces back", in that the system quickly eradicates said information. This keeps Wikipedia unbiased and free of bad information completely through system self-organization.

4. Results and Conclusion

We have applied systems thinking principles to popular websites and proved that they are present in the websites. By analyzing the results of the applications, we discovered that the strength of the presence of each characteristic correlates with the nature of the website. Essentially, the presence of each of the three characteristics depends on what kind of website it is. This can be seen in Fig. 2 which is a table of the presence of each characteristic of each website based on our analysis. If two websites are designed to achieve the same goal or have the same function, they will most likely have the same level of each characteristic. For example, Facebook and Google Plus are both social networks. They both have similar levels of resilience, hierarchy and self-organization. Wikipedia and Yahoo answers are another example.

Both websites are designed to share information, but Yahoo Answers does not necessarily have information that is completely accurate. We can consider Yahoo Answers' function to be "connecting people so that they can share information", while we can consider Wikipedia's to simply be "providing easy access to correct information". Due to the difference in their functions, Wikipedia and Yahoo Answers somewhat differ in their three characteristics.

Website	Resilience	Self-Organization	Hierarchy
Facebook	Fairly Present	Very Present	Minutely Present
Google Plus	Fairly Present	Very Present	Minutely Present
eBay	Fairly Present	Somewhat Present	Fairly Present
Craigslist	Fairly Present	Somewhat Present	Minutely Present
Wikipedia	Fairly Present	Very Present	Very Present
Yahoo Answers	Fairly Present	Fairly Present	Very Present
YouTube	Very Present	Fairly Present	Very Present
World of Warcraft	Fairly Present	Somewhat Present	Very Present

Fig. 2: Characteristics of Websites

5. Acknowledgements

Our thanks to Professor John Doyle, California Institute of Technology and to the UCLA Wireless Media Laboratory.

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