

Systems Theory and Social Networking: Investigation of Systems Theory principles in Web 2.0 Social Network Systems

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Abstract

With over 2 billion internet users logging in more than 142,460,000,000 hours per month online, 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. Social media has become the dominant shared characteristic on the Internet, with an estimated 49.3% of the top 10,000 websites in the world having links to Facebook, the most popular social networking website, on their respective homepages. And, all online websites and forms of social media can be considered systems. Self-organization, resilience, and hierarchy are theorized to improve the function of a system. In viewing social networks as systems, there is conflict with the theory that hierarchy improves the function of a system. This paper uses the popularly used social media site, Facebook, to study which aspects of the function of a system relate to the lack of hierarchy. Through a survey of Facebook users on their usage of various features of Facebook, and the comparison of these findings to predictions made on the usage of each of these features using Systems theory, conclusions are reached on how the absence of hierarchy in social media sites impacts the system.

1. Introduction

Online media has become an integral part of life today, with over 2 billion internet users logging in more than 142,460,000,000 hours per month online. People socialize, play games, shop, work, and, communicate online. Google is used to search for information for professional and personal consumption; music is accessed and bought online, videos are streamed live for real-time viewing, games are played interactively and social media communication channels such as Facebook, LinkedIn and Twitter have become as popular as email. 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.

With a prolific growth in the web over the past several years, largely due to the changing trends in the use of Web 2.0 technology that aims to enhance interconnectivity, self-expression and information sharing, virtual communities and services, such as social networking sites, photo and video sharing services, blogs and wikis have developed and evolved.

Social media has become the dominant shared characteristic on the Internet, with an estimated 49.3% of the top 10,000 websites in the world having links to Facebook, the most popular social networking website, on their respective homepages[1]. It is one of the most commonly used tools today by consumers, for social networking, as well as increasingly by corporations for digital marketing and

private commerce [2-3]. It has become one of the most powerful elements used in the “bully pulpit” or direct communication between politicians and citizens to affect change or support [4-5].

And, all online websites and forms of social media can be considered systems. A system can be defined as a group of elements organized in a specific manner that interact with each other to function as a whole, as explained in Jackson and Checkland [6]. Examples of a system include a body, a car, a forest and a city. Elements of the city (system) could be the various municipal government organizations, such as the Department of Water & Power, the Department of Transportation and the Police Department.

According to Skyttner [7] and Meadows [8], systems work with greater efficiency, accuracy, and positive structure when self-organization, hierarchy and resilience are present. In Mangal [9], eight large-user-base, primarily, user-to-user interaction websites were analyzed using the systems thinking theories established in [8]. While all of the websites had some amount of social interaction present, Facebook and Google Plus were the two primarily social networks analyzed. Both these sites are considered to have fairly present resilience, very present self-organization, but minutely present hierarchy. The fact that the hierarchy of both sites is low, yet both sites (and hence systems) appear to function well, is cause for interest, as that result conflicts with the theory that hierarchy improves a system.

The discrepancy of low hierarchy presence in Facebook (and Google Plus) is partially caused by the nature of social networks (to simulate and go beyond social interaction[8]). This paper uses the popularly used social media site, Facebook, to study which aspects of the function of a system relate to the lack of hierarchy. Through a survey of Facebook users on their usage of various features of Facebook, and the comparison of these findings to predictions made on the usage of each of these features using Systems theory, conclusions are reached on how the absence of hierarchy in social media sites impacts the system.

The result will provide information to be applied to the creation of, addition to, and management of specific systems, utilizing information about the relationship between the function of a system and the elements in it and assisting to hone and develop processes of function-based systems-thinking. The implications of research in this field are interdisciplinary, spanning from helping in the development of efficient manufacturing techniques to managing hospital surgery rooms and tools, to ensuring a new software program is as intuitive as possible. To determine which aspects of the function relate to the lack of hierarchy, input by users of Facebook about individual aspects and features of Facebook was received through a survey, and the

averaged user response to each feature was compared to the predicted systems-thinking response range. Systems theory was used to predict whether each feature improves the website’s efficiency and assists the website in performing its function.

The rest of the paper will discuss the three characteristics of systems that make them function better and the function of a social network. Hypothesis will be defined, Methodology used will be discussed, followed by the Findings and the Analysis and Conclusions.

2. Characteristics of Systems

First, however, the three systems characteristics of Self-organization, Hierarchy and Resilience must be understood.

In [9], a system was defined as “a group of elements organized in a specific manner that interact with each other to function as a whole”, for the purposes of the analysis conducted in that paper. For the

purposes of the more in-depth, focused research conducted for this paper, a more detailed look at the function of a system and, of social networks is added. Thus, the definition of a system is explicated to ‘a group of elements, organized in a specific manner corresponding to the overall function of the system, that interact with each other and entities within the system with the purpose of achieving the function as a whole’.

These are the three characteristics defined by influential systems thinker Donella Meadows [8] 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.

1. Resilience refers to a system’s capability with regards to bouncing back or returning after a major change or setback, to a form similar to what it was prior, in order to continue pursuing its goal with similar efficiency as in its prior state. For example, a salamander is able to regrow limbs after being attacked, and when a human body suffers from blindness the other senses become sharper. 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.

2. Self-organization is the characteristic of a system in which some or all a system’s elements categorize, delegate amongst, cooperate amongst, or filter and manage themselves. The formation of a government, for example, is self-organization, whether a monarchy or a democracy forms. In either case, certain elements in the system are organizing the system and assigning a function and roles. In event of a monarchy, an element (the monarch) directly affects other elements through the decisions it makes, and indirectly affects others by delegating tasks to sub-managers (dukes or ministers). The other elements (citizens) in turn can affect the more powerful elements by voicing public opinion or social unrest, as well as simply keeping the system running and following rules. In a democracy, certain members of a society join together and, often with public support, decide that a democracy should be formed. The leaders of a democratic society make decisions regarding the populace, and the populace in turn provides the leader with power. Thus the system, initially consisting of individuals with no specific government, eventually self-organizes into a society with a self-regulating government. Self-organization can be considered a sort of enthalpy. 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.

3. Hierarchy is the categorization or ordered nature of a system where individuals, groups, or entities are conceptually situated relative to one another based on power or rank. Often, a system will self-organize into a hierarchy. For example, a group of individuals working in a company might be organized into a hierarchy, with the CEO directly managing the senior officers, the senior officers the managers, who in turn relay information to lower-level employees. A hierarchy can also be represented as a mathematical rooted tree, in which nodes lead out from other nodes, beginning with a single node, or the “root”. Each successive level of nodes is ranked below the previous level, and the root is the highest ranking node. Hierarchy has positive effects on a system as it allows for continuation of work and delegation even if

part of a system fails. For example, if a node in a root tree is deleted, a node below it, or a new node, can replace it. 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. A hierarchy can be a form of self-organization if elements in a system organize themselves in a hierarchical way.

4. Efficiency is the ability of a system to work towards its function and behave in accord with its goal, with the least amount of detraction, the greatest speed, and the least amount of external energy input. Detractors from efficiency would be unnecessary frills that actually get in the way of the system, features whose goals are not in accord with the system's overall function, or aspects and entities in a system that slow down an element or cause it to expend more energy. Using the example of cars in a trafficked city street, increased traffic will decrease efficiency by causing more wasted gas while cars are idling, using energy to increase speed, and using energy to decrease speed. Efficiency will also be decreased because more time will be spent trying to achieve the goal of reaching a destination than if there were less traffic. In Facebook's case, elements that would decrease efficiency would be a feature or part of Facebook that would decrease social interaction or make users behave differently than they otherwise would. Other efficiency decreasing factors would be a fault in the design of the website that would make contact between users difficult or slow, social negativities that would not have occurred without Facebook's existence and, possible involvement, or a lack of users logging onto, and remaining logged onto, the site. According to systems theory, features or systems that are less efficient, as efficiency pertains to Facebook, should make users' experiences less enjoyable or accurate, as the system will have more trouble working towards its function.

These relationships are displayed in the model below in Figure 1.

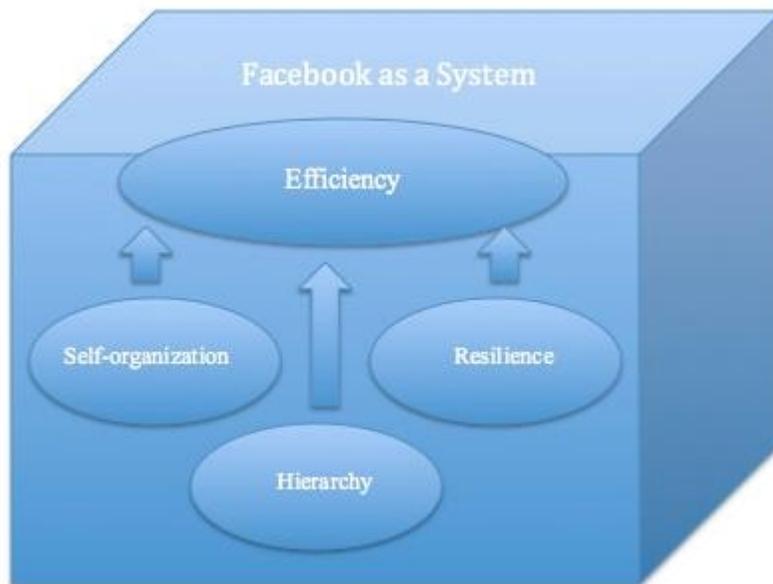


Figure 1: Model

2.1 Function of A Social Media Site Such As Facebook

Social media sites aim to stimulate social interaction and possibly go beyond social interaction. Seitzinger [10] describes the function of a social media site, such as Facebook, from the

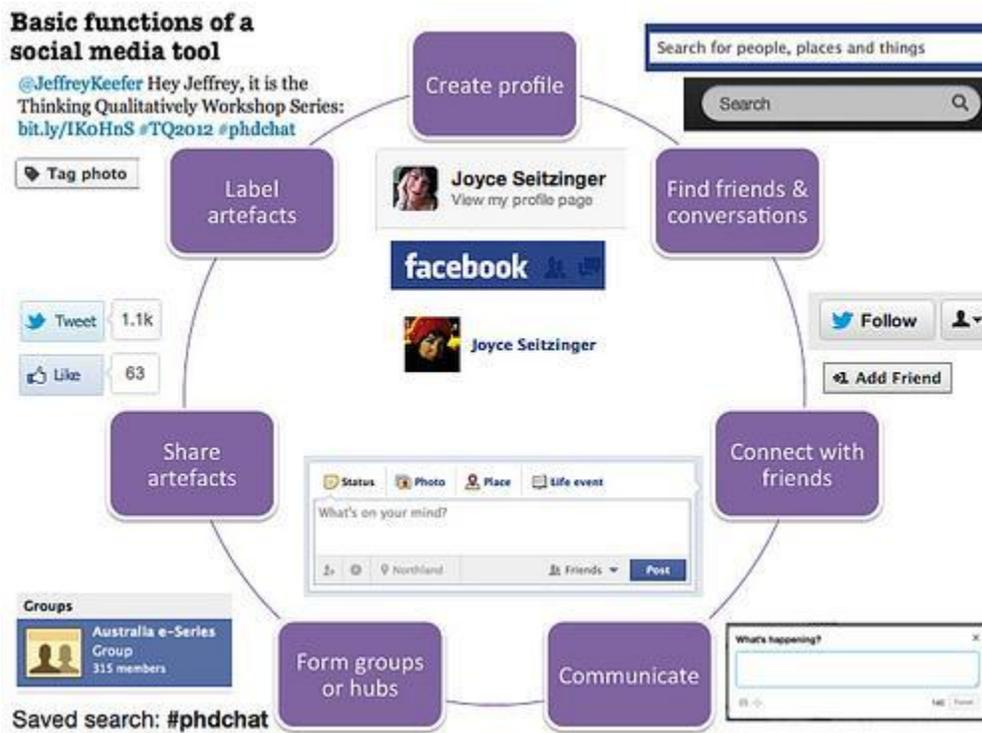
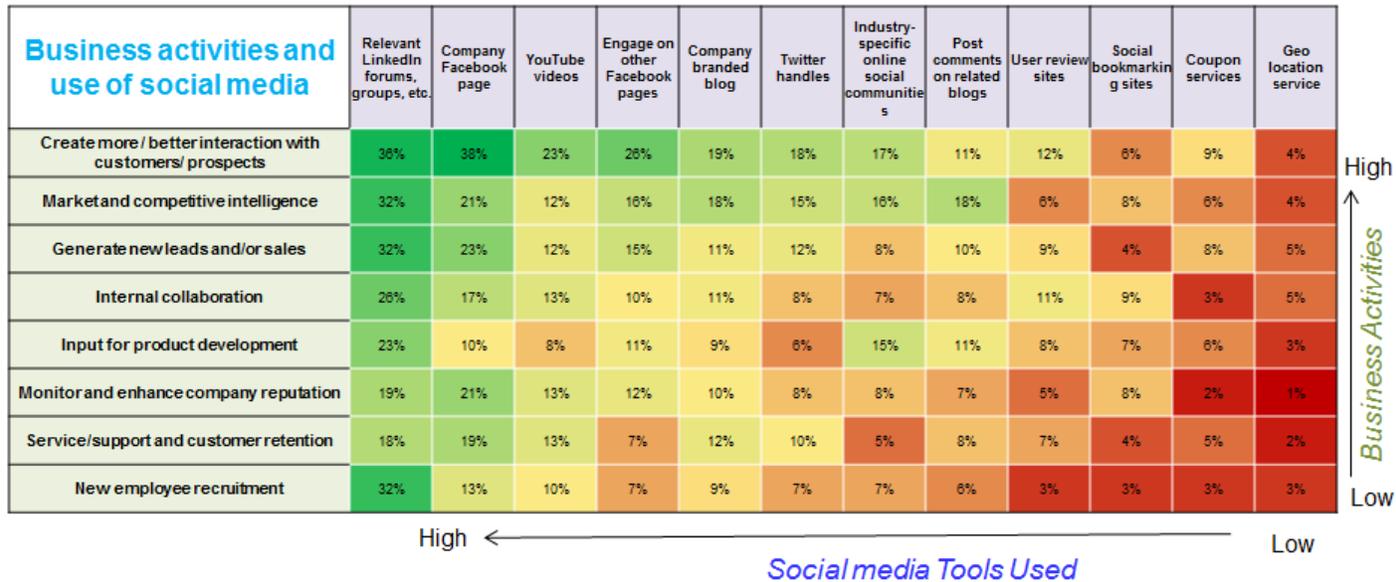


Figure 2

Perspective of an individual, using Figure 2.

A user will create a profile and the find friends to befriend using the search feature. Once connected with friends, they can communicate with each other using chat/messaging and posts. A user is also able to create or join groups, post photos, videos, events and questions or comment/like those posted by their friends. With over 1.1 billion users, if Facebook were a country, its users would constitute the third most populous nation in the world, after China and India, according to the McKinsey Quarterly report [11]. Businesses are realizing how effective Facebook can be for amplification of word of mouth effects and using it to accomplish primary business functions, as demonstrated in a study conducted by the SMB Group in the 2012 Small and Medium Social Business Study [12]. Figure 3 shows that small and medium sized businesses are using social media tools for performing various business functions including customer related functions of marketing, sales and brand management as well as internal functions of collaboration, new product development and recruitment. Social media sites can be sources of rich user information and result in opportunities for customized advertising [13]. Hence are including social networking on their intranet sites. This would increase communication, removing regional and social barriers, bringing about knowledge sharing among users with common interests and resulting in collaborations leading to increased productivity and faster innovation [14].

Social Media Tools Used To Accomplish Primary Business Functions: All Current Users (Medium Businesses)



20) What are the primary business functions that you use these social media tools for?

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Figure 3

Source: 2012 Small and Medium Social Business Study, SMB Group

Social media sites are systems and systems function are to function better when they demonstrate the characteristics of Resilience, Self-organization and Hierarchy. According to Mangal [9], Facebook exhibits self-organization through users inviting friends who in turn invite other friends - recursively and through "like" pages and by joining "groups" of interest. Facebook has the presence of resilience providing users the experience of being at a social gathering. However, there is apparent lack of hierarchy in Facebook. Small hierarchies may exist within parts of Facebook such as elevated status when playing games on the site, or post filtering (picks which posts to move higher) for an individual or a group of friends, the latter is not necessarily a user-created or even user-generated hierarchy but some kind of organizational tool that's built into facebook that ranks people, or certain facets of users' online profiles, might be present. There is no built-in hierarchy for the entire site. Infact, hierarchy may even conflict with pursuing the function of the site as interacting with one friend may take precedence over interacting with another friend, but interactions between friends are not ranked, and one friend is not more powerful than another friend.

Predictions:

As defined earlier, Facebook has become a highly popular tool today by consumers, for social networking, as well as increasingly by corporations for digital marketing and private commerce. Features of Facebook are listed and analysis of predictions for each feature is discussed. Predictions are based on using systems logic, if the feature helps the system then users will like it. The anticipated response is a prediction of what the user will say about a specific Facebook feature based on his/her experience in using the system that is Facebook. Fifteen features are discussed. Each feature and the anticipated response for it is listed in the Table 1.

Feature Number	Feature Name	Systems Theory Anticipated Response
1	Chat/Messages (C)	Very Positive
2	Friending (F)	Very Positive
3	Like (L)	Somewhat Positive
4	Groups (Gr)	Very Positive
5	News Feed (Nf)	Somewhat Positive
6	Notifications (No)	Very Positive
7	Photos (Ph)	Very Positive
8	Poke (Po)	Neutral
9	Status Updates (St)	Very Positive
10	Timeline (T)	Somewhat Negative
11	Wall (W)	Somewhat Positive
12	Video Calling (V)	Very Positive
13	Subscribe (Su)	Neutral
14	Events (E)	Very Positive
15	Questions (Q)	Very Positive

Table 1

1. Chat/Messaging (C) - This feature was launched by Facebook in 2008 as an instant messaging within Facebook friends, one-on-one in real-time [15]. In terms of this feature exhibiting the systems theory functions of Resilience, Self organization and Hierarchy, Chat is resilient and self organizing as it's success is dependent on the availability and participation of two users only, which has a reasonably high likelihood. Hierarchy for Chat though, is only possibly significant in one part of the process in whichever party is the first to start the chat. It is however possible that some amount of hierarchy could be brought in from external or prior social interactions. Since this latter is not built directly into the Facebook site, it can not be counted as a constant part of the system. Chat assists the Facebook system's efficiency in working towards its goal because it corresponds directly with one of the most significant and common forms of social interaction: a private conversation between two people. *Anticipated response: Very Positive.*

2. Friending (F) - With social media sites such as Facebook, asking to become Friends with a friend or Friending, has become a verb [16]. From the viewpoint of the structure of the Facebook system, Friending is incredibly resilient because it depends exclusively on the interest or lack of action of two users. The only way the resilience of Friending could even be tested is if one of the users simply does not use the site. As with Chat, the only hierarchy that could be present would be in case of who sends the first friend request for Friending. Self organization is even better as it only depends on one user to send the Friending request and the other user to simply check and respond to the request in their Facebook account. Friending assists the Facebook system's efficiency in working towards its goal because it corresponds with the basic function of networking: connecting with a friend. *Anticipated response: Very Positive.*

3. Like (L) - Clicking the Like button on the Facebook site creates a connection between the content and the user who clicked the button [17]. Like is also very resilient because it only requires activity to be performed by one user. Because the result of Like is publicly displayed, the interaction with all of the users who will be able to view it, is not impeded. Hierarchy is again essentially not present in Like because of the lack of complexity since involvement from both users is minimal. Self organization is high because of limited user involvement and minimum user participation. Because the act of Liking is not very essential nor weightbearing in social interactions, Like does not assist the Facebook system's efficiency greatly in trying to achieve its function. *Anticipated response: Somewhat Positive.*

4. Groups (Gr) - The Groups feature of Facebook allows users to create and manage their own groups. It also allows users to join other groups that are of interest to them. The joining of a group involves one user (possibly two if the group has restricted access); however, groups involve significant participation and have founders, leaders, and administrators, in which there may or may not be overlap. Therefore, there is a reasonable amount of hierarchy inherent in the formation and running of a group. However, due to the flexible structure, egalitarian governing methods can be utilized. In addition to joining a group, the Groups feature also includes the interaction that ensues after a user has joined a group. Members of groups organize themselves into the group - creating and joining the group is considered member self organization as users who lead and create the group are themselves members of the group. Groups assist simulation of social interaction very significantly since groups are often formed in social interactions. Groups go beyond normal social interactions by bringing together individuals with a common interest or situation who may not have otherwise come together. Groups are resilient, especially in some very large group cases, because interaction is not entirely dependent on two people meaning if only a fifth of the members of a group are available, activities related to or focused on the group can still be performed. For

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example, if a group is created for fans of civil war re-enactment in the Seattle area, 1000 people are members of the group, if only 200 people are online at a point in time, when one member posts about an upcoming civil war re-enactment, 200 group members will be reached immediately and the bulk of the remaining membership will be reached in a reasonable amount of time. Therefore, groups are resilient because their inherent goal of bringing together a large group of people works in conjunction with the large participation rate. Groups help the Facebook system's efficiency perform its function by bringing together small to large numbers of people. *Anticipated response: Very Positive.*

5. Newsfeed (Nf) - Newsfeed is a feature of Facebook that informs users of their friends' public activities, statuses, photos, likes, tags, wall posts, etc. As long as users are logging into Facebook in a not entirely private capacity, their friends will receive their public updates and the feature will function to full capacity. Facebook's artificial intelligence based post filtering allows a user to control his/her Newsfeed. A user has the ability to sort posts according to most recently posted stories or top stories and display or not display posts from certain friends or about certain topics. Hierarchy is therefore exhibited in Newsfeed through the post filtering feature. Through the post filtering feature, users are also unknowingly self organizing individually. Newsfeed goes somewhat beyond general social interaction by providing more information and experience from users' lives than most friends would normally know and have. This breach of privacy may cause user dissatisfaction with the Facebook system's efficiency and may spread information resulting in specific user dissatisfaction, e.g., if information is spread through Facebook about a specific user that may not otherwise have been spread easily, the user may be unhappy. *Anticipated response: Somewhat Positive.*

6. Notifications (No) - A user receives a notification if he/she is tagged in a post or photo by a friend or if a group the user is a member of, chooses to notify their users each time the group posts. Notifications are fairly resilient because a notification becomes visible as soon as a user logs onto Facebook. Only one user's action is required for access to a Notification. While the actions of other users generate notifications, the actual act of accessing Notifications involves one user only hence making Hierarchy not feasible. Self-organization would simple be based off of the decisions of individuals who check their Notifications. Notifications assist the Facebook system's efficiency in carrying out its function by simulating direct contact between two individuals. Notifications also go beyond common social interactions by allowing interactions from a distance and allowing conversation and knowledge about situations in which some of the parties may not even have been present. *Anticipated response: Very Positive.*

7. Photos (Ph) - If a photo is just posted, in the actual posting of a photo, excluding other features discussed in the other characteristics, the only social interaction involved is the viewing of the photo by other users. Thus this feature is quite Resilient, provided the user has friends who go onto Facebook and are able to view these photos. Self-organization is present simply because users will post their own photos and their friends will view them. The only possible Hierarchy that could be present for Photos is not actually inherent in the simple uploading of a photo. A possible Hierarchy could be present in the popularity of a photo which would depend on the number of Likes, Comments or sharing by friends. Photos help the Facebook system's efficiency by simulating social interaction by simulating sharing of experience or sharing of stories. Photos go beyond social interactions by allowing users to know about and partially experience activities of their friends that they would not have otherwise. *Anticipated response: Very Positive.*

8. Poke (Po) - Users have the ability to “poke” one another using the Facebook feature. A user can choose to poke one of his/her friends and the recipient of the poke sees that the user has poked and has the ability to poke the first user back, which can be seen by the first user. Poke is Resilient because it requires only two users to participate - one to send and the other to view. The Poke feature is as self-organizing as the other two person features in Facebook. The only possible Hierarchy is in who initially sends the poke or whether or not the recipient responds to it. However, as it is not an actual interaction and nor does it add to normal social interaction, Poke does not help the Facebook system’s efficiency and could actually detract from the system’s functioning. In minimal to no way does “poking” mirror actual social interaction, and is a very limited action, if at all acknowledged as having social representative social capability or functionality. Thus, while it does feature the three characteristics, it does little in the way of furthering the goal of the system. *Anticipated response: Neutral.*

9. Status Updates (St) - Users can post Status Updates which generally are about their activities and can include photographs with friends tagged, their locations and other updates. The creation of a Status Update is fairly Resilient because it only requires one user to participate. The actual interaction in Status Updates is reasonably Resilient because friends of users really only need to logon and possibly scroll thru their newsfeed to use Status Updates. The post filtering feature of Facebook can introduce Hierarchy in Status Update postings if a user chooses to do so. Users also post about their locations and spending time together and comment, often publicly, often thru Status Updates bringing about Self-organization. Users self-organization through Status Updates is very beneficial to the Facebook system because it spreads information to users’ friends, may provide a user with information to build the rules for filtering posts, encourages other users to like, comment and communicate and, simulates spreading information from one person to another on a significantly larger scale. Status Updates therefore increase the efficiency of the Facebook system because they simulate users telling one another things and go beyond Status Updates by allowing social information dispersal at a larger scale. Status updates are also beneficial to Facebook system because they allow users to share experiences as a group with their various friend groups. *Anticipated response: Very Positive.*

10. Timeline (T) - Timeline is a feature in which users assign dates to events and Facebook automatically records dates and times of status updates, photo postings, events and changes in profile information and, charts it on the user’s page. Users can choose what to emphasize and hide but Facebook, by default, gives the most popular and the most recent updates and photos greater weightage. User Hierarchy is entirely not present in Timeline because it involves only the post of one user. Self-organization is somewhat present because users have the ability to emphasize and hide certain events from their Timeline as well as add information. Timeline is somewhat Resilient because (i) while it only requires a single user’s participation, it can occur without promoting or altering any social interaction which could increase the amount of time in which social interaction happens which could detract from the system’s function and (ii) it detracts from the simulation of social interaction as, in common and immediate social interaction and when a person meets another person for the first time, normally individuals choose how much of their life to reveal but in the case of Timeline, by default, all significant events on which there is information on Facebook are viewable. Timeline can therefore result in reducing the Facebook system’s efficiency. *Anticipated response: Somewhat Negative.*

11. Wall (W) - Each Facebook user has a 'wall' on which the user's status updates, posts in which they are tagged and photos appear, and, on which other users can also post public messages, photos, videos or links. There is no default user Hierarchy on Wall as posts are displayed in chronological order and users are not ranked in any way. Disregarding features that are accessible through the Wall that are discussed elsewhere in this paper, Self-organization is not present in Wall because Wall is simply a method of displaying user activities and information. Wall is very Resilient because, to exist, it only requires participation by one user and need only to be viewed to be used. Wall helps the Facebook system's efficiency by simulating social interaction by providing a parallel to being with the user through many different situations. *Anticipated response Somewhat Positive.*

12. Video Chatting (V) - Video Chatting is similar to chat but it is through video. Self-organization, Hierarchy and Resilience are same as what they are for chat discussed earlier. Video Chatting assists the Facebook system's efficiency in simulating social interactions accurately by simulating a face-to-face conversation. *Anticipated response: Very Positive.*

13. Subscribe (Su) - Users can subscribe to another user or a page and, when a user comments on a post of some kind or posts a photo or update of some kind, they are automatically subscribed to that post or update and have the option to unsubscribe. Subscribing to a post or photo implies that whenever friends interact with the user's contribution of a comment or the post, a notification appears. Subscribing to a page or a person causes all the public posts or photos by the person or page to appear on the subscribed user's newsfeed. Subscribe is significantly Resilient because it only requires subscribing by one user and the process of fairly one-way interaction of the subscribed user or page posting only requires the posting user and their subscribing users. Self-organization is very present in Subscribe because pages will be created and users will post and share their own information and photos and other users will find, subscribe to and share the subscribed user's information on their own. Subscribe is inherently somewhat Hierarchical because in the relationship between the subscriber and subscribed, the subscriber is the provider of information and content, and therefore higher in the hierarchy. Hierarchy also develops in Subscribe as a result of the subscribe system in which pages and users are ranked by number of subscribers. The subscribe system does not simulate social interaction but it does simulate events and situations that involve other people as it often provides entertainment or information and thus adds to the experience of the Facebook system which could make the Facebook system more or less efficient. *Anticipated response: Neutral.*

14. Events (E) - Users can create Events to serve as a kind of invitation or reminder to attend a certain event or perform a certain activity at an assigned date or time, all of which are provided by the user creating the event. Users can then select which users or groups of users are invited and have access to the event. Hierarchy is present in the user creating the event; Self-organization is very present in the Events system as users create their own events and the invited users respond on their own, e.g., if a user wants to have a gathering with friends at Time Square on July 31, 2013 at 3pm, the user can create the event, provide the relevant information and select the friends he/she wants to invite or have at the event; an event can also be open and allow anyone to access the information. Events are significantly Resilient because, to be created, they only require one user but, to achieve their purpose fully, every invited user must log on and respond in some way. Events help the Facebook system's efficiency greatly in simulating social interaction by simulating the sending and responding to invitations or the telling of every invited person about an event. *Anticipated response: Very Positive.*

15. Questions (Q) - Users or administrators of pages have the ability to send all of their friends or connected users a question with either an open ended or pre-selected choice answer format. Questions are somewhat Resilient as, while the posting of a question only requires the participation of one user or administrator, often, the quality of the result is dependent on the question reaching all of the members of the group that it was sent to. Thus, the Resilience of Questions is dependent on the number of users that answer, which means that if the feature is to function to its full capacity, every intended user has to sign in, see the question and answer it. Self-organization is significantly present in Questions as users and administrators will often ask their own questions and there is a high chance that the user who the question is targeted to, will be inclined to answer the question since the user who sees the question is most likely joined the group or friends circle by his/her own choice. The only Hierarchy that could be present would be in the relationship between the user who posts the question and the recipients. Questions assist the Facebook system's efficiency in working towards its function by simulating gathering information from one's friends and go beyond normal social interaction by accumulating information from an often larger group with greater efficiency, as it requires less effort on the part of the information-requesting entity. *Anticipated response: Very Positive.*

3. Methodology

A survey was used to collect data to verify the above predictions. A questionnaire was created listing the Facebook features discussed in the Predictions section. Survey respondents were asked to rate the the impact of the each feature and the accuracy of the simulation of social interaction through social network in one combined rating, thus assuring that the negative, positive, and neutral effects of each feature, regardless of the immediate effect each feature has, were accounted for as an overall, as follows:

1. This feature has a negative impact or causes the responding user to behave unlike they normally would or causes responding users to behave negatively
2. The responding user does not like this feature or or this feature does not have a significant impact on the responding user's use of Facebook
3. This feature is useful or the responding user enjoys using it or it causes responding users to behave very much like they do in real life

Number 1 implies a negative feel for the feature by the respondent, number 2 implies neutrality and selection of number 3 implies the respondent having a positive feel towards the feature as he/she uses Facebook.

3.1 Data

SurveyMonkey was used to create an online survey which was sent to 125 people. 61 responses were received, which are analyzed in the findings. Of these, 33% of the respondents were 11-20 years of age, with the next two demographic groups being 21-30 years with 20% responses and 41-50 with about 16% responses. Figure 4 represents the percentages of the age of respondents in the survey. The proportions of ages in the statistics correspond with estimates from Facebook[18].

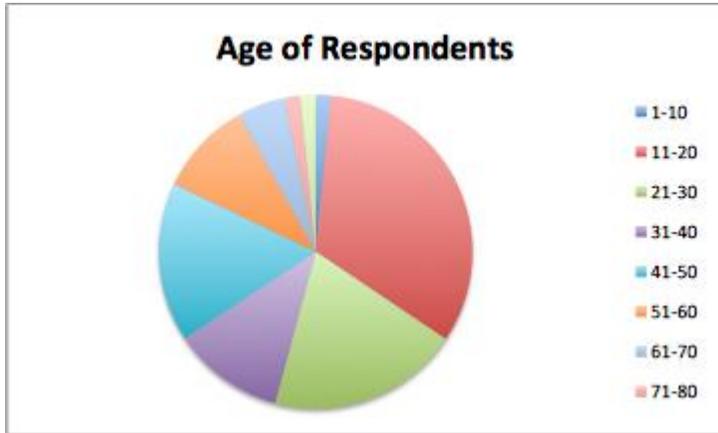


Figure 4: Percentages of age of respondents in survey

Of the respondents 46% reported being on Facebook 1-10 hours a month with 21% on Facebook for 11-20 hours; 15% for 21-30 hours; 12% for 31-40 hours and 3% for over 40 hours a month. Figure 5 represents the percentages of hours per month of facebook usage by respondents.

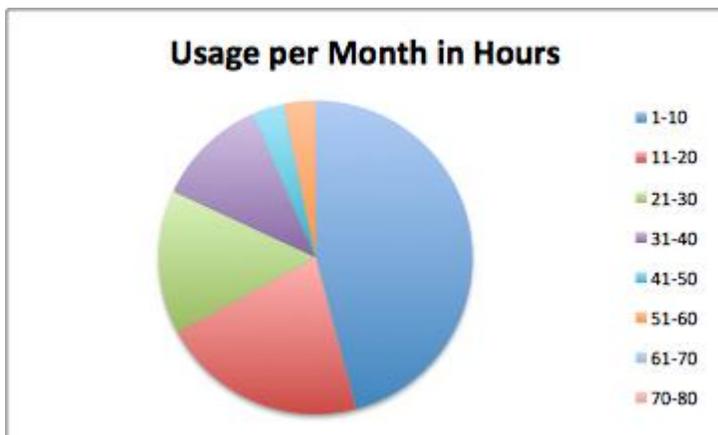


Figure 5: Percentages of hours per month of facebook usage by respondents

4. Results

Table 2 lists each of the fifteen Facebook features and the anticipated responses based on systems theory analysis, as discussed above, X_i where $i = 1, 2, \dots, 15$.

Actual responses from survey responses, for each feature, are calculated using the following equation

$Y_i = \left(\frac{\sum_{n=-1}^1 f(n) * n}{\sum_{n=-1}^1 f(n)} \right)_i$ where $i = 1, 2, \dots, 15$, n represents the selected option by the respondent (1 for positive, 0 for neutral, and negative one for negative) and $f(n)$ is equal to the number of respondents that selected each option. Y_i is classified as Very Positive, Somewhat Positive, Neutral, Somewhat Negative or Very Negative using the following criteria:

- Very Positive: $0.6 < X \leq 1.0$ (average 0.8)
- Somewhat Positive: $0.2 < X \leq 0.6$ (average 0.4)
- Neutral: $-0.2 < X \leq 0.2$ (average 0)
- Somewhat negative: $-0.6 < X \leq -0.2$ (average -0.4)
- Very Negative: $-0.6 < X \leq -1.0$ (average -0.8)

The correlation between the Anticipated response based on systems theory analysis (X_i) and the Actual response from the survey respondents (Y_i) is shown in the correlation column. Discrepancy Z_i is found between the predicted (X_i) and the actual (Y_i) for eight of the fifteen features and is depicted as $Z_i = X_i - Y_i$ and are explained in the next section.

Number	Feature Name	Anticipated Response based on Systems Theory (X_i)	Actual Response based on Survey (Y_i)	Correlation between X_i and Y_i	Discrepancy Explanation (Z_i)
1	Chat/Messages (C) (i=1)	Very Positive, X_1	$(46*1 + 12*0 + 2*-1)/61 = 0.72, Y_1$	Very positive: Very positive	$0.80 : 0.72, Z_1$
2	Friending (F) (i=2)	Very Positive, X_2	$(37*1 + 18*0 + 5*-1)/61 = 0.52, Y_2$	Very Positive: Somewhat Positive	$0.80 : 0.52, Z_2$
3	Like (L) (i=3)	Somewhat Positive, X_3	$(39*1 + 17*0 + 3*-1)/61 = 0.59, Y_3$	Somewhat Positive: Somewhat Positive	$0.40 : 0.59, Z_3$
4	Groups (Gr) (i=4)	Very Positive, X_4	$(24*1 + 33*0 + 3*-1)/61 = 0.34, Y_4$	Very Positive: Somewhat Positive	$0.80 : 0.34, Z_4$
5	News Feed (Nf) (i=5)	Somewhat Positive, X_5	$(31*1 + 25*0 + 2*-1)/61 = 0.48, Y_5$	Somewhat Positive: Somewhat Positive	$0.40 : 0.48, Z_5$
6	Notifications (No) (i=6)	Very Positive, X_6	$(45*1 + 11*0 + 2*-1)/61 = 0.70, Y_6$	Very Positive: Very Positive	$0.80 : 0.70, Z_6$
7	Photos (Ph) (i=7)	Very Positive, X_7	$(50*1 + 7*0 + 3*-1)/61 = 0.77, Y_7$	Very Positive: Very Positive	$0.80 : 0.77, Z_7$
8	Poke (Po) (i=8)	Neutral, X_8	$(9*1 + 39*0 + 10*-1)/61 = -0.02, Y_8$	Neutral: Neutral	$0.00 : -0.02, Z_8$
9	Status Updates (Su) (i=9)	Very Positive, X_9	$(30*1 + 25*0 + 4*-1)/61 = 0.43, Y_9$	Very Positive: Somewhat Positive	$0.80 : 0.43, Z_9$

10	Timeline (T) (i=10)	Somewhat Negative, X_{10}	$(15*1 + 35*0 + 8*-1)/61 = 0.11, Y_{10}$	Somewhat Negative: Neutral	-0.40 : 0.11, Z_{10}
11	Wall (W) (i=11)	Somewhat Positive, X_{11}	$(38*1 + 20*0 + 2*-1)/61 = 0.59, Y_{11}$	Somewhat Positive: Somewhat Positive	0.40 : 0.59, Z_{11}
12	Video Calling (V) (i=12)	Very Positive, X_{12}	$(9*1 + 49*0 + 1*-1)/61 = 0.13, Y_{12}$	Very Positive: Neutral	0.80 : 0.13, Z_{12}
13	Subscribe (Su) (i=13)	Neutral, X_{13}	$(6*1 + 49*0 + 4*-1)/61 = 0.03, Y_{13}$	Neutral: Neutral	0.00 : 0.03, Z_{13}
14	Events (E) (i=14)	Very Positive, X_{14}	$(24*1 + 33*0 + 3*-1)/61 = 0.34, Y_{14}$	Very Positive: Somewhat Positive	0.80 : 0.34, Z_{14}
15	Questions (Q) (i=15)	Very Positive, X_{15}	$(6*1 + 45*0 + 6*-1)/61 = 0.0, Y_{15}$	Very Positive: Neutral	0.80 : 0.00, Z_{15}

Table 2: Values for Y_i and X_i and corresponding categorizations

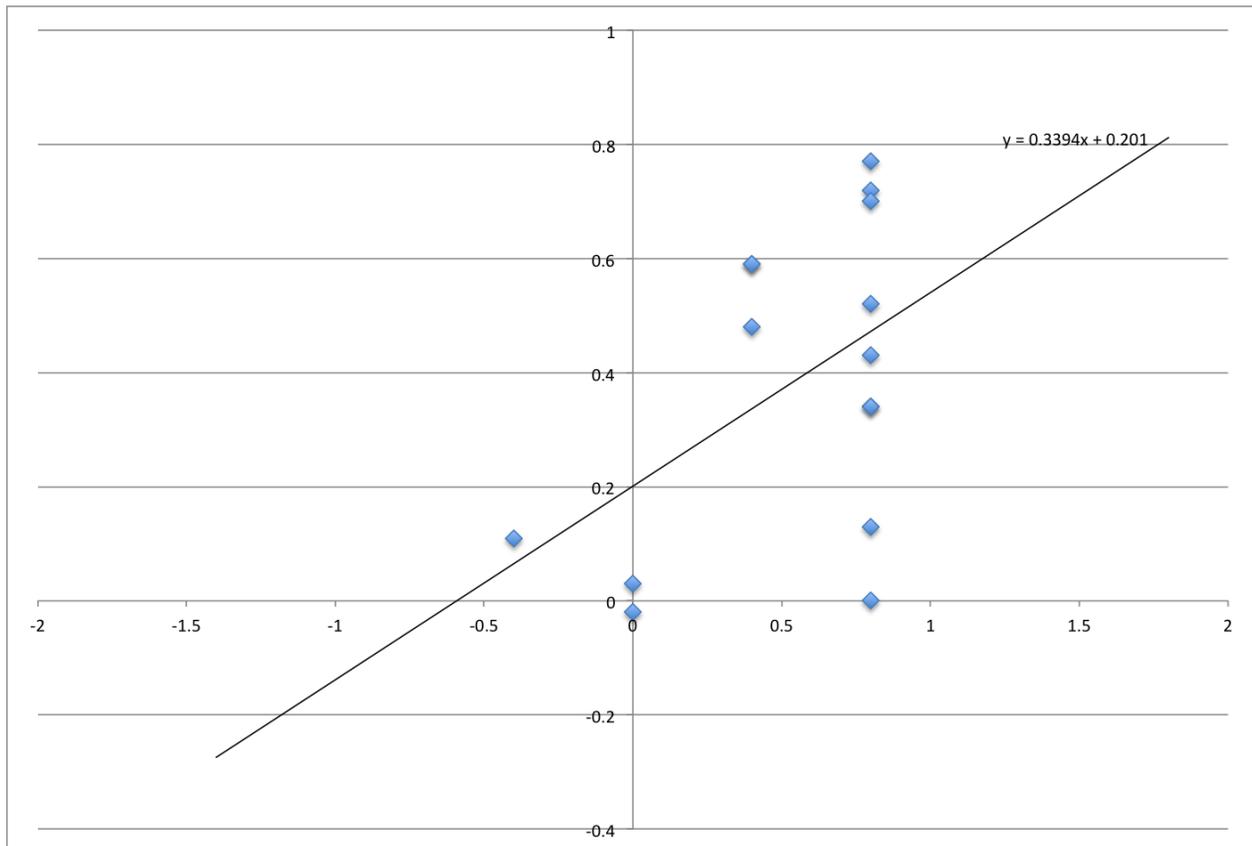


Figure 6: Graph of Y_i versus X_i

Graph of Y_i (Y-axis) over X_i (X-axis) is shown in Figure 6. Formula of trendline represents utilizable shift ratio in conversion from user-to-user-based systems theory analysis to user response.

5. Discussion of Discrepancies

With full consistency in this set of data, a trend has appeared regarding the discrepancies found. In the case of every data point in which there was a significant difference between the systems-thinking predicted response and the actual user response, the user response was closer to neutral and less positive than the systems response. The user response is consistently closer to neutral in part because users that are not very familiar with a feature but have used it in the past are likely to select neutral so as to not make a premature judgement of it. The user response is consistently more negative likely due to the fact that the opinion of users of a feature on a social networking website is formed in part by the activity of the individuals that use said feature, resulting in a certain amount of conflict or negativity being generating as is inevitable in the presence of a variety of individuals. Thus, with the opinion shifted by the presence of people rather than simply based on the functionality of the feature itself, the negativity that stems from the availability of non-logic based input causes the user response to lower.

6. Conclusions

The existence and state of the discrepancy has significant implications within the process of systems theory and large group or user-to-user based system comparisons. When taking into account the data based on opinions and interactions of users in a social network and/or user-to-user based connection system or website, a constant k should be calculated in order to broaden the amount of progress in the field of such development. In an alternative case using large enough numbers of users that correspond to the proportions of demographic statistics of the system involved in that case, the constant k calculated in this paper may be utilized to determine the necessary shift of responses in order to successfully analyze the system and compare data to that found using systems theory standards. In addition, the process outlined in this paper may be utilized to diversify the range of systems-to-real comparisons, increasing the ability of researchers to predict user response to new functions and services, and assisting businesses and administrators of human systems to form and grow.

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