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Trust In Social Software

A survey of trust on Commute Greener!, at Volvo IT

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Trust In Social Software:

A survey of trust on Commute Greener!, at Volvo IT

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***Abstract**-Trust is a fundamental aspect in social software. Studying trust is helping to determine trustworthiness in online system in various context, e.g. online transactions, information sharing, website filtering, etc. To explore this problem, a survey was conducted., which is based at Commute Greener! at Volvo IT. This survey exams possibles factors which could potentially influence user's trust in social software by using an appreciative trust model as theoretical background which has been reviewed and examined in electronic commerce. And the definition of this appreciative trust is used as presumption in survey. Thus, the result of survey tested this definition through four dimensions by using this appreciative trust model. The results of this paper extent the range of the appreciative trust model into various social software context.*

Key word: Trust, an appreciative trust model, Social Software

1 INTRODUCTION

Internet service have been increasingly used in our daily life, business transaction, mass accessing of information, and interpersonal interactions through email, instance message, social-community etc, Internet-based provision is dominating the way of communication. In internet environment where has limited information to provide for those who activate in e-commerce. i.e, in traditional business, buyers can directly check goods before purchasing, in stead, consumers have to accept the "the risk of prior performance", which leave them in a vulnerable position. The inefficiencies resulting from this information asymmetry can be mitigated through trust[1]. Trustworthiness of online services need to be considered in web-based system design. A survey conducted by Grandison et al[10] shows that there is need for a high-level of abstract way of specifying and managing trust, which can be easily integrated into applications and used on any platform.

Previous examples in e-commerce shows trust is a vital component in every business transaction. Customers trust sellers will provide the same information as they presented on internet, and it supposes not to disclose any private customer information(name, address, mobile number, credit card numbers etc.). The competence and honest of supplier's trust

will influence the decision from buyer. Therefore, a large number of contributions are made to establish healthy relation between *trustor* (buyer) and *trustee*(seller). Risk is a major concern which hinder user's belief in security, dependability, and competence of the system he/she is interacting with[1][2][3][4][6][8]. To solve this problem, Computer scientists have taken those concerns and made their efforts on building reliable and dependable mechanisms on e-commerce, e-service; such as reputation mechanism¹.

The migration from centralized information system to distributed internet applications shows transactions are spanning a range of domains and organizations, but not all of which might be trusted in the same extent[10]. There are very limited study about how trust is developed on social software like facebook², twitter³, slideshare⁴, LinkedIn⁵ etc. In these social software, transaction is not their business goal. Instead, those sites need acquire millions of users and assist them to construct a new social network[14][15]. And users are either gathered manually or automatically. for example, by email, instance message, and the web of trust for decentralized cryptographic keys [15]. Comparing e-commerce, nature of trust in those social software is not only limited to risk of transactions. Therefore, there is need to study trust, which can be used as automated assist to identify reputation based on status in the network and use as a filter for user's rating[14][15][18]. *The research question of this paper is: how is trust built in (Commute Greener!)social software?*

This research have 6 main sections. Section 1: [Introduction], research question and problem domain are presented. Section 2: [Research Method], method have been used in this paper and the description of cooperation with industry. Section 3:[Related Research], the theoretical background have been studied and the appreciative trust

1 Reputation system/mechanisms collects, distributes, and aggregates object's historical information[19]. And it is explicit important for brewing trust environment between strangers. Different from the physical world trust and reputation can be observed by local communities through physical communication. However, this environment is missing on internet. Reputation system also should design to help people to recognize who to trust, who has malicious behavior, and potential valuableness of decisions[1][19].

2 www.facebook.com

3 www.twitter.com

4 www.slideshare.com

5 www.linkedin.com

model is introduced. Section 4:[Empirical Data and Discussion], in this section empirical data is joined with discussion. Section 5:[Conclusion], results are presented. Section 6:[References].

2 Research Method

This research is using quantitative research, and survey method as a method. Because survey is considered as efficient to collect a number of data, and it is flexible in sense that a wide range of information can be collected. Although people who choose to response the survey might think different from who do not response the survey, which might biasing estimates[17]. The academic objective of this paper is to explore how trust is built in social software. Additional to build an understanding through related research, a main part of this study has taken place in collaboration with industry participation. Collaborative practice research is a way to organize and conduct research based on collaboration between researchers and practitioners[11].

2.1 Data To Be Collected

This specific case for empirical data has been made by studying at Volvo IT and initiative of Commute Greener!. The Volvo group is a leading provider of commercial transport solutions, services and products[12]. Commute Greener! grouped a certain amount users, but for some reason the number of users is declining. Therefore, this research is also aims to provide suggestions for Commute Greener! to have their users back.

2.1.1 Use Of Library

A number of research materials such as published papers and journals which are relevant to, they have been reviewed and categorized into repository. Through databases such as the IEEE and ACM portals, which are available through Chalmers Library: CHAIN. Papers available in these databases were considered research papers/materials as they were either peer reviewed or published in a journal or conference. Apart from the library databases, books and papers recommended from supervisor were used in this research.

2.1.2 Cooperation With Industry

This research project cooperated with "Commute Greener!" at Volvo IT, Lindholmen. Weekly meeting and "Google group" were the formal contact channel. Tasks and schedules were planed at each meeting. This research started from background study of "Commute Greener!6". researcher was able to access information about "Commute Greener!" as well as the supportive company "Volvo group". Three workshops were hold between other researchers who specialize in social science, the team shared materials and the distribution list of questionnaire.

2.1.3 Commute Greener!

Commute Greener! is an online community which affiliated with Volvo IT, which initiated at 2009 spring. The objective of Commute Greener! is to reduce global and personal CO2 footprints, and by making green commuting more attractive and engaging. It is a personal CO2 calculator that use the web-client and mobile-client to access, giving an engaging social network. Below shows how Commute Greener! works. As most social software, registration is compulsory before you can start using it. There are two ways to access to Commute Greener! web-client and mobile-client.



Figure 1: front page after user login

Here provide the picture after user login to Commute Greener!(see Figure1). There are seven core functions on Commute Greener! "Registration", "Setting a baseline", "Inviting friends", "Setting a reduction target7", "Starting and stopping a journey to calculate my CO2 emission", "Checking my CO2 Savings Performance8", "Updating your status", part of them are presented in Figure2. Besides CO2 calculation, Commute Greener! also allow user to share their personal experience to other user and receive latest news from Commute Greener! at the "Pulse"function, figure3.

- 7 Reduction targetSet up a reduction target, then system calculate CO2 emission based on the target. Then system can start to calculate their CO2 emission after user begin their weekly journey as they set up.
- 8 Under the category "Performance" user can start to calculate their personal CO2 by set up a BaselineBaseline is user's normal weekly commuting pattern and his/her saving progress is measured against.

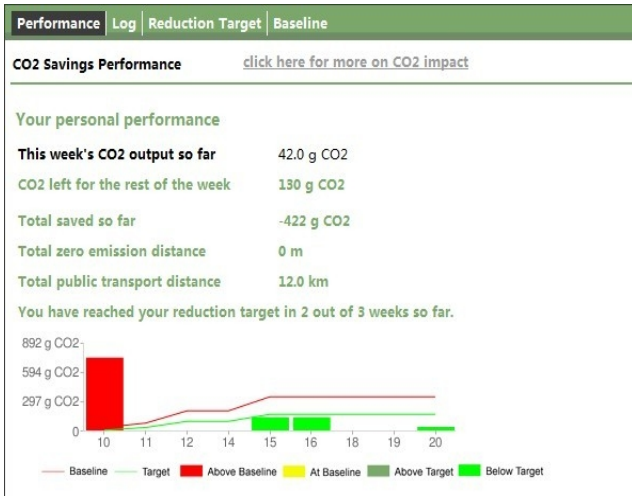


Figure2(left): User can see their performance of CO2 reduction.

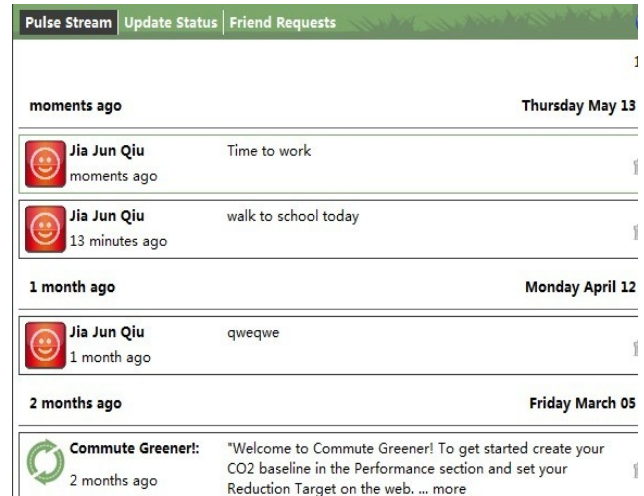


Figure3(right): Social interactions on Commute Greener!

2.1.4 The Survey

The survey provides all needed data in this research, also the discussion is based on data collected from this survey. The questionnaire was designed by using software SurveyMonkey⁹. It is an internet-based survey software. And the survey was distributed to all registered users of Commute Greener! by email. Six steps have been done before launch the survey.

1. Determine the objective of survey
2. Determine size of the survey
3. Determine a time frame and schedule.
4. Determine how much budget need to the survey.
5. Create questionnaire
6. Pre-test the questionnaire

The theory behind this questionnaire is an appreciative integrated model of trust[see Related Research]. This model guided the design of questions. In order to explore how trust is built in social software. The definition of the appreciative trust model will be tested by using the survey. Therefore, questions are categorized into four main areas (Information Environment, System, Person, Task) according to the appreciative trust model[see Related Research]. Target respondents are only registered users of Commute Greener!. Since "SurveyMonkey" is a commercial software, and research team have only limited budget. The scheduled time frame is 20 days. Before launch the survey, questions were tested by limited interviews, including project manager at "Commute Greener!", and supervisors at IT university of Gothenburg, to make sure questions are understandable and related to research topics. Table1 shows the common answer type in this survey, however, it could be different when goes to

specific question. In order to measure trust in terms of those four dimensions, a formula is introduced to calculate if respondents have positive beliefs. Presented in table1.

Type:A1	Strongly agree	agree	Partly agree	Partly disagree	disagree	strongly disagree
Type:A2	Easy	Quite-easy	Quite-complicated	Complicated	N/A - I didn't try	\
Type:A3	Yes	No	\	\	\	\
Formula for calculate positive belief	If ("Strongly agree"+"agree"+"Partly agree")/Response Count > ("Partly disagree"+"disagree"+"strong disagree")/Response Count then it is recognized as positive belief					

Table1: Question types and Formula

2.2 The Execution Of The Survey

Here presents the execution of "CommuteGreener Survey¹⁰". It is finished by research group at Commute Greener, 2010. This survey was delivered to 642 users of "Commute Greener!". The valid date of this survey started from 16 apr 10 to 6 maj 10. There are total 131 respondents and they were used as population. Considering there are limited respondents, thus the survey did not make a sampling in this case. In each question, the number of respondents were counted individually, because in some case respondents did not fully answer questions. In each question, the number of respondents who answered question plus that who skipped

9 www.surveymonkey.com

10 The original link of "CommuteGreener Survey" <http://www.surveymonkey.com/s/commutegreener2010>

question is equal to the population (131 respondents). And it states counted valid respondents in each question table [see Empirical Data and Discussion]. Respondents' private information are protected. In order to make data manageable, numerical ID was used as distinction for each question and respondent. Answers to open-ended question are not fully listed. Only those are considered relevant.

3 Related Research

3.1 Trust

Trust is complex and abroad subject, it could be interpreted to variant meanings in terms of sociology, psychology, computer science etc. In order to know how trust is applied in social software, the article first views those definitions from sociology perspective and then views trust in online applications. It is because it is not only a technical system which is trusted, but rather a socio-technical system that includes a complex institutions [6].

3.1.1 Trust In Sociology

There is no consensus in literature about what trust is and definition of trust is adopted by different research topics [1][3][5]. In Oxford dictionary where states several categories of explanations and including historical research references. For example, one definition is when it states as verb, "To have faith or confidence; to place reliance; to confide". Definitions of trust from dictionaries are the most common use concepts which help to create scientific definitions [5]. McKnight et al. [5] collect those definitions from Random House, Webster's, and Oxford, furthermore, they compare those definitions with wide range of existing scientific definitions and conclude trust in multidimensional perspectives. The remarkable endeavor from their research is Trust Construct Model (TCM). It generalizes and formalizes trust into six constructs, which are, Trusting behaviors, Trusting intention, Trusting belief, System trust, Dispositional trust, and Situational Decision Trust. It establishes a framework for future researchers and it also could be transferred to other fields, for instance, computer science.

Understanding TCM is helpful to know the complexity of humanistic environment. The combination of constructs reflect both institutional phenomena and behavior, which facilitate middle and higher level of analysis of trust related phenomena [5]. As a roadmap of trust, this model explicitly encompasses What, How, When, and Why. And also these constructs cover the more frequently-used scientific and common meanings of trust. Those refined knowledge are particularly help to explore theories behind human-computer interactional.

3.1.2 Trust In Internet-based Software

Based on internet service, people can choose different coffee brand from different providers, but they can not savor a cup of coffee with electronic mugs; Users can find environment protection volunteers on online communities, but they are not sure if the one just dumped garbage on the street. As more and more breaches of trust occurred due to malignant and innocent attacks, computer scientist recognize the importance of trust in design of internet-based software [2][8][13], which could be able to facilitate e-commerce and online communities.

Trust of nature on internet have been intensively studied. Many new hybrid forms of trust infrastructure are prompted. Those researches involve computational mechanism of trust with socio-psychological studies. Daignault et al [8] propose a new infrastructure of trust involve three parties; First, applicable information, which is communicated online, including privacy, security statement, company information. This is aim to establish the trust between trading parties through the directness of the communication. Second, by making the use of reputation system that capture word-of-mouth¹¹ feedback and a history of previous performance of parties. Reputation system left the comments and rating for future buyers. for example, eBay, the summarization of feedback helps to reduce potential customers' perception of risk. Third-party rating are communicated online in a number of ways which are including trustmarks, seals of approval, label bureaus, trust intermediaries or directories of trust sites. for example, TRUSTe¹², they help thousands of business prompt online safety and guide customers to sites that protect their online privacy. As a third party, they have a convincing manner, and that propagate trust to authorized company, who can convince buyers. In order to design conception of online trust into real system, researchers intend to discovery what could be trust-related characteristics of online interactions. [9] comprehensively describe trustworthy in Networked Information System (NIT), in their study, the dimensions of trustworthiness encompasses correctness, reliability, and security, privacy, safety, and survivability, the complexity is their interdependent relations [9]. Schneider's study argued a diverse, complex, and self-evolving system, which is actually aim to create a trust-environment, as Friedman et al [3] conclude. Therefore, Friedman et al, did not involve too broadly technological realm both and social-interaction. rather, their study of 10 trust-related characteristics of online interactions can be seen as trust atmosphere. They confirm this atmosphere including Reliability and Security of the technology, Risks around, Misleading language and images, Informed consent, Accountability, Saliency of cues in the online environment, Insurance, Performance history and

¹¹ Word-of-mouth could be considered as reputation, Dellarcas defined it as a reference to the passing of information from person to person and it is one of the most ancient mechanisms in the history of human society [20].

¹² www.truste.com

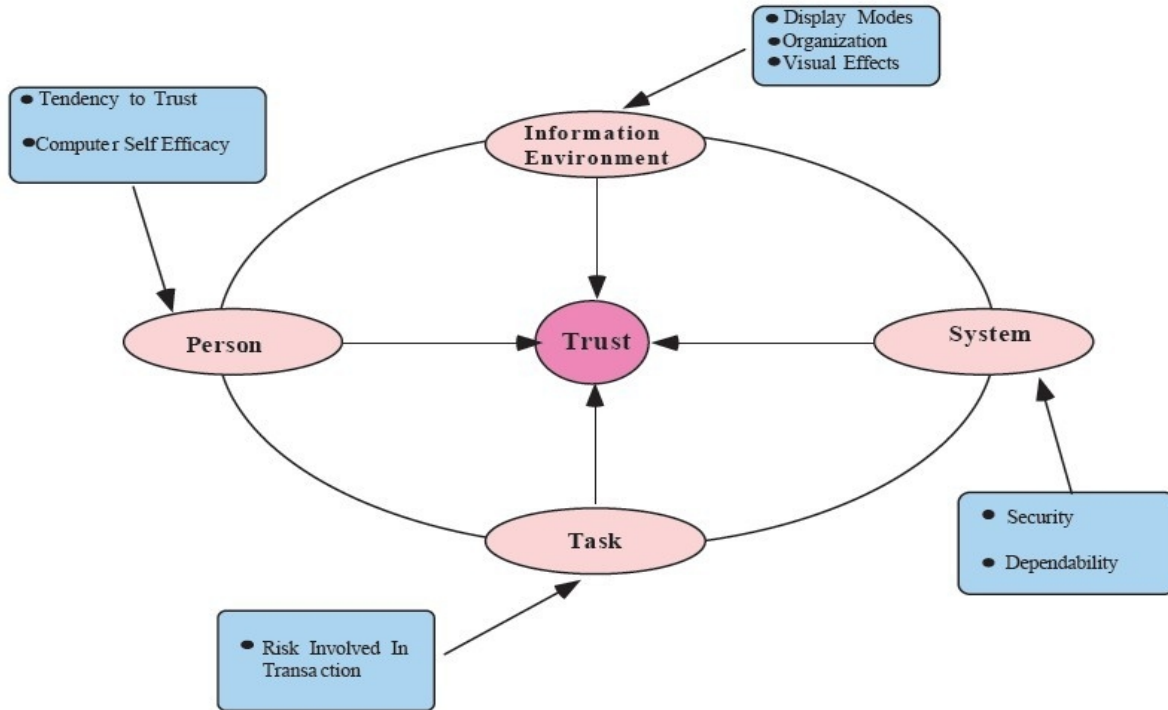


Figure 4: An appreciative trust model by Kini et al[2]

Reputation. It is similar to Daignault's et al 10 principles of online trust, which explore all possible reasons affect beliefs of trustee.

3.1.3 An Appreciative Trust Model In E-Commerce

In further researches, appreciative trust model of online transaction is developed by Kini and Choobineh[2]; In their model, defining of trust is, "Trust in a system is defined as an individuals belief in the competence, dependability, and security of the system under conditions of risk". And in this research, their definition of trust is adopted, and appreciative guide the implementation of the survey and used as theoretical background.

The reason of using this appreciative trust model is because it gives a strong theoretical foundation of trust for evaluating social software. This trust model is developed based on three categories of trust, Individual trust, Societal Trust, Relation Trust. Besides, Kini et al[2] also intend to integrate models of trust between humans and machines. Four major dimensions in online trust are categorized into Information Environment, System, Task, Person. In those four dimensions, each of them contains factors to measure certain dimension. It will be further discussed in Discussion section.

3.2 Social Software

Social Software has played a major role in changing the way of people interact online. It has led to the birth of read/write Web, where users are both consumer and producer of online contents[7]. There are various definitions of social software, Rockwell says Social Software is a virtual world, which support activities people can normally do in physical world[16]. It supplies trade fairs, legislative hearings, conferences and shopping etc. Particularly, they said the overriding of social software is not simulation of physical world but conversation. For further declaration of social software, Farkas states a general and conceptual definition, and it is adopted in this research[7].

- It allows people to communicate, collaborate, and build community online.
- It can be syndicated, shared, reused, or remixed, or it facilitates syndication.
- It lets people learn easily from and capitalize on the behavior or knowledge of others.

What's more, Farkas also listed some characteristics of social software, for instance, Easy Contents Creation and Contents Sharing, Conversations: Distributed and in Real Time, Transparency, Portability and so on. Those definition and summary of characteristics facilitate understanding of social software, and also they can be used to measure and determine if a software is categorized as social software.

3.2.1 Online Community

Community is not only means the group of people who live in the same area. Community can also be categorized by personal characteristics, such as people's religious, ethnicity, or interests. It could be local or global [7]. Online community is simply a group of people gathering online for a special purpose. Internet help them to know to meet and to share common interesting. Farks also defines four primary types of online communities: first type, interests of community, which is based on a specific interest or concern. second type, sustaining communities, participants have already knows each other; people join the communities specially to stay in connect. Third type, communities of action, which are formed to coordinate online and offline actions. These communities are aim to accomplish a large task or try to mobilize like-minded people on internet. Fourth type, local communities, which is categorized by geography[7].

4 Empirical Data and Discussion

This section introduce empirical data together with analysis and discussion. All together this will lay a foundation for the conclusion as related to the research questions. The major part of the discussion is devoted to the data gathering and the analysis of factual information. Data sets which provided in this section are original and authentic. The collected data have been divided into four areas according to the appreciative trust model (Information Environment, System, Risk, Person). Data extraction of Information Environment, in this area the effect of information presentation to trust has been studied, in terms of user interface design at "Commute Greener!". Second data extraction, System, in this section user's perception of dependability and security of the system have been studied. Third data extraction, Person, individual's personality of characteristics, nature of trust are explored. Forth data extraction, Task, where is aim to investigate user's view of risk when they use the system.

4.1 General Characteristics

Before starting to explore how trust is built in Commute Greener! software, I exam two precondition of the survey. First, do most user think the system is trustworthy? Second, do most user not concern risk is a primary factor when they using social software? Because according to definition of the trust model, it measures the impact of these factors on the development of trust in electronic commerce. An assumption is made in the beginning, that risk of security may not be user's main concern on (Commute Greener!) online community.

To know the answer of that, two questions were prepared. Figure 5.1 the histogram (Q1) shows the number of respondents who believe Commute Greener! is trustworthy. Figure 5.2, The histogram (Q2) measures how respondents balance the risk and benefits when they use Commute Greener!. The vertical axis of Q1 shows around totally 111 of the respondents answered these two questions. There are 72 of the respondents choose "agree". And totally 107(96%) respondents do have a positive belief(11+72+24/111=96%) that Commute Greener! is trustworthy. Q2 shows 48 of the respondents chose "partly agree". As can be seen from this histogram, the percentage of respondents who believe Commute Greener! is beneficial are higher than that of respondents who think Commute Greener! is risky.

By having those two results, preconditions are satisfied. It suggests most users think Commute Greener! is trustworthy. The trust model is applicable to measure trust from those four areas(Information Environment, System, Person, Task). Q2 tells us, most respondents think risk is no longer a critical factor in Commute Greener!. Then It can said that risks involve at Commute Greener! is not major concern. It also proves the significance of this study.

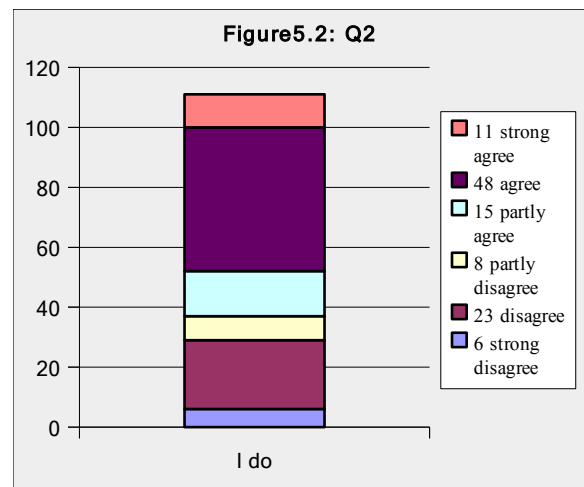
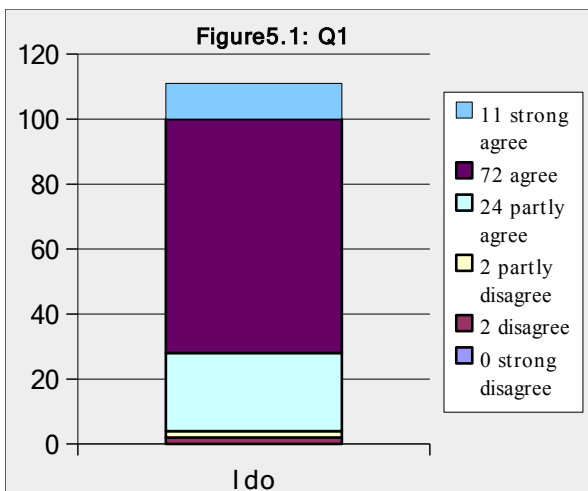


Figure 5.1(left), Q1: I believe Commute Greener! is trustworthy. Figure 5.2(right), Q2: I feel that risk of using Commute Greener are lower than the benefits.

4.2 Information Environment

According to the appreciative trust model, in this dimension, it measures trust from external side of the system, which including:

- **Display models:** Investigation of usage of the core functions provided by "Commute Greener!"
- **Organization:** "Commute Greener!" is supported by "Volvo" group, and measure if user have awareness of the organization behind.
- **Visual Effect:** Investigation of presentation of the system, such as frames and multimedia.

4.2.1 Display Models

A website contains a large number information, it could be very difficult for user to understand every detail of functionality. However, a website should at least make user aware those most important functions of system. How do user from Commute Greener! think about? First two general questions are viewed(Q3, Q4). Then a discuss will be made.

As is indicated in Q3, the number of respondents who did not read the blog on Commute Greener! are 73%. Only 26 of the respondents who positively think the blog is useful(4+18+4=26). In Q4, it further inquires the usage of the seven core functions. From statistic of Q4, totally 5 functions are recognized as understandable(positive belief). And 41 of the respondents did not try the function F3. As well as 22 of the respondents did not try function F4. It tells us those two functions failed to provide services as it should do. On another side, it needs to be noticed in F5 and F6 respectively have similar amount of users between answer "N/A-I didn't try" and "Quite easy". Comments from open-ended answer option have been collected: user1 "I had a problem with finding correct geographical for my journey." user2"I would say the web interface is quite poor, it's hard to edit the journey data and UI is not very discoverable." user3"I want more performance feedback."

The blog entries give useful information.								
Answer Options	N/A - I don't know	strongly agree	agree	partly agree	partly disagree	disagree	strongly disagree	Response Count
I do	85	4	18	4	2	3	0	116
<i>answered question</i>								116
<i>skipped question</i>								15

Table2: Q3, is tagged to "Display Model" at the dimension of "Information Environment" of the appreciative trust model.

Were the following features of Commute Greener are easy to use?						
Answer options	Easy	Quite easy	Quite complicated	Complicated	N/A - I didn't try	Response Count
F1: Registration	52	18	5	1	0	76
F2: Setting a baseline	16	28	19	10	3	76
F3: Inviting friends	18	14	2	1	41	76
F4: Setting a reduction target	20	20	12	2	22	76
F5: Starting and stopping a journey to calculate my CO2 emission	15	17	14	14	16	76
F6: Checking my CO2 Savings Performance	12	26	12	4	22	76
F7: Updating your status	17	24	10	6	19	76
Comment (optional)						10
<i>answered question</i>						76
<i>skipped question</i>						55

Table3: Q4, is tagged to "Display Model" at the dimension of "Information Environment" of the appreciative trust model.

4.2.2 Organization

Information about supportive company are usually ignored. For user, those information could be quite significant, because it could affect their personal beliefs to a software. In this factor It is aim to discover how do respondents think of Volvo before they decided to register? What impressions do they have to the organization behind Commute Greener!? Commute Greener! is sub-organization at Volvo IT[see Commute Greener!]. In this case, It has been already known that Volvo IT belongs to Volvo group. So questions Q5,Q6 are focus on Volvo. Question Q7 is about Commute Greener!.

In Q5, this question received 130 valid respondents. Totally 119 of the respondents who have/had relationship with Volvo. As can be seen, 72% of the respondents are employee of Volvo group. And 27 of the respondents are Volvo car owners. As well as 29 of the respondent's friends or relatives own a Volvo car. There are also 41 (car owner+buss user) of the respondents who have experienced vehicle product of Volvo. Next question Q6 presents respondent's impression of Volvo.

Six words have been generalized which can properly describe Volvo from different perspectives. Six words have been brought into three groups. First group ("Quality", "Safety", "Environmental care", "Social responsibility") are considered as positive. Second group "Pollution" is recognized as negative. Third group "Transport Solution" is considered as neutral. From the results, 92% of the respondents list word "Safety" as the most relevant to Volvo brand. Following votes went to "Quality"(80%) and "Environmental Care"(71%). 22% of the respondents voted second group "Pollution". In Group three "Transportation Solution", 66% of the respondents think Volvo relate to vehicles. Overall, it is clear that most respondents have relationship with Volvo and most of them have positive image to Volvo brand.

As can be seen in Q7, 91% respondents answered they have been aware that there is a connection between Volvo and Commute Greener!. Knowing this result, can it be said that people join Commute Greener! because of good reputation of Volvo? Do respondents trust Commute Greener! because they have intuition of trust to Volvo? It is likely that respondents bring their positive belief from Volvo to Commute Greener!. Or saying it is resulted from trust transitivity¹³, in this case Volvo is referral between user and Commute Greener!. Although, It could not be seen direct dependency between Volvo brand and respondents' motivation. However, the analysis suggests that the reputation of Volvo have positive effect on respondent's belief on Commute Greener!. And it can be further speculated that the positive effect increase user's faith Commute Greener! is trustworthy.

What is your relation to Volvo? (you may choose more than one alternative)		
Answer Options	Response Percent	Response Count
I am an employee	72,3%	94
I am a Volvo car owner	20,8%	27
I use Volvo buses (public transport)	10,8%	14
I have a friend/a relative who works for Volvo	18,5%	24
I have a friend/a relative who owns a Volvo car	22,3%	29
None (no relation)	8,5%	11
Other (please specify)	6,9%	9
<i>answered question</i>		130
<i>skipped question</i>		1

Table4: Q5, is tagged to "Organization" at the dimension of "Information Environment" of the appreciative trust model.

13 Trust transitivity is a method. It means trust can be derived from transitivity path. i.e. when A trusts B, and B trusts C, and B refers C to A, then A can derive a measure of trust in C based on B's referral combined with A's trust in B[1].

In your opinion, which of the following are connected to Volvo? (you may choose more than one alternative)		
Answer Options	Response Percent	Response Count
Quality	80,8%	105
Safety	92,3%	120
Environmental care	71,5%	93
Social responsibility	44,6%	58
Pollution	23,1%	30
Transport solutions	66,2%	86
Other (please specify)	6,9%	9
<i>answered question</i>		130
<i>skipped question</i>		1

Table5: Q6, is tagged to "Organization" at the dimension of "Information Environment" of the appreciative trust model.

I was aware that there was a connection between Commute Greener and Volvo when I registered		
Answer Options	Response Percent	Response Count
Yes	91,5%	119
No	8,5%	11
<i>answered question</i>		130
<i>skipped question</i>		1

Table6: Q7, is tagged to "Organization" at the dimension of "Information Environment" of the appreciative trust.

4.2.3 Visual Effects

Factor visual effect is used to measure how respondent experience the visualization at Commute Greener!. If they like the layout, color etc.

There are 112 valid respondents have been calculated in Q8. As can be seen, 52 of the respondents agree the presentation of Commute Greener! looks professional. Totally, 94 of the respondents have positive opinion ($9+52+33/112=83\%$) on the frame of website. However, when it turns to second option "Phone application(mobile-client)", this question only received in all 64 valid respondents and, 56 of the respondents hold positive image ($6+24+26=87\%$) about the frame of mobile-client. As can be seen from the results, the number of respondents who prefer mobile-client outweighed that of respondents who prefer web-client. Despite, the number of respondents who use phone application is only half amounts compare to those who use website. Q9 shows 98 of the respondents think positively ($9+47+42=84\%$) that the appearance is attractive.

Generally, from this statistics, it indicates that most respondent hold on positive opinion about design/visual effect. However, it needs to be notice that there are only limited respondents who use mobile-client to access Commute Greener! compare to the amount of respondents who use web-client. As described in "Display model"section some respondents complained the usability of mobile-client. It could be a possible reason which hinder the number of users of mobile-client.

In short, data from Information Environment dimension suggest that most respondents have positive beliefs in organization, visual effect, display model. However, some important features did not successfully play its role and bring its effectiveness, mostly it is because of the unqualified usability both in web-client and mobile-client. In this research, it is impossible or hard to measure how much it affects respondent's trust in Commute Greener!. But it does hinder user's confidence to the system. Additional, more than 80% of the respondents have positive image to Volvo brand, and also 91% of the respondents were aware that Volvo is the supportive organization behind Commute Greener!. By knowing that, it could be concluded trust transitivity is one characteristics of trust. In this case the reputation of Volvo is the referral which makes Commute Greener! more trustworthy and increase user's belief in competence of the system.

I find Commute Greener looks professional. (you may only evaluate Website access if you don't use Phone Application)							
Answer Options	strongly agree	agree	partly agree	partly disagree	disagree	strongly disagree	Response Count
Website client	9	52	33	8	6	4	112
Mobile Client	6	24	26	3	2	3	64
<i>answered question</i>							116
<i>skipped question</i>							15

Table7: Q8, is tagged to "Visual Effects" at the dimension of "Information Environment" of the appreciative trust model.

I find the general layout/design attractive.							
Answer Options	strongly agree	agree	partly agree	partly disagree	disagree	strongly disagree	Response Count
I do	9	47	42	8	6	4	116
<i>answered question</i>							116
<i>skipped question</i>							15

Table8: Q9, is tagged to "Visual Effects" at the dimension of "Information Environment" of the appreciative trust model.

4.3 System

In the dimension, it focuses on quality attributes of Commute Greener!.

- **Security**, Commute Greener! should protect personal information such as phone number, home address etc, particularly, as well as user's commute patterns.
- **Dependability**, in this case, it is aim to investigate if Commute Greener! is available for users.

4.3.1 Security

Having been stated in introduction, security is one of the major concern for users in e-commerce. But how do user perceive security at Commute Greener!? Do user worry about they personal information are disclosed?

111 valid respondents were collected in Q10, and it shows 103 of the respondents agree that Commute Greener! will not disclose their information. User's commuting patterns were thought to be the most sensitive information. Because Commute Greener! calculate their personal CO2 emission based on user's commute patterns[see Commute Greener!]. As can be seen in Q11, 80 of the respondents feel it is secure to hand over their commuting patterns to Commute Greener!. Although, rest of them think it is insecure, but still 21 of the respondents are positive skewed(who chose "partly agree"). Generally, there are at least 103 (13+72+18) of the respondents who do believe their private data are protected. But comparing the result Q11 and Q10, 23 of the respondents no longer believe Commute Greener! is secure when they were asked about their private commuting patterns.

From the result, it suggests that user of Commute Greener! hold positive beliefs to security of the system. And users on Commute Greener! do not think risk of security is their main concern. It does also support the result from general characteristics section that 96% of the respondents believe Commute Greener! is trustworthy.

I believe Commute Greener will not disclose my personal information.							
Answer Options	strongly agree	agree	partly agree	partly disagree	disagree	strongly disagree	Response Count
I do	13	72	18	4	4	0	111
<i>answered question</i>							111
<i>skipped question</i>							20

Table9: Q10, is tagged to "Security" at the dimension of "System" of the appreciative trust model.

I feel insecure giving Commute Greener information about my commuting patterns.							
Answer Options	strongly agree	agree	partly agree	partly disagree	disagree	strongly disagree	Response Count
I do	3	7	21	13	58	9	111
<i>answered question</i>							111
<i>skipped question</i>							20

Table10: Q11, is tagged to "Security" at the dimension of "System" of the appreciative trust model.

4.3.2 Dependability

One question is designed in this factor. Dependability could be also interpreted to availability in this case. Can user access to Commute Greener! whenever they want? Q12 investigates both web-client access and mobile-client access.

Q12 illustrates around 105 of the respondents had no problem to access the system. Although, it is difficult to tell that connection problem may be caused by the server of Commute Greener! or third party internet provider. In spite of that, 101 of the respondents had not experienced by link interrupted. $92\%[(101+101)/2+(125+125)/2]$ of the respondents had no problem with the login system. In the open-ended answers, user1 "My phone do not support the application Nokia e51¹⁴." user2 "No Android¹⁵ application, not really user-friendly." user3 "hard conversions because we are not metric, and it didn't seem geared for me because we don't have a lot of public transport options."

14 A mobile phone brand, Nokia E51 could support web reading. www.nokia.com

15 A mobile platform developed by google. <http://www.android.com/>

In general, Commute Greener! successfully provides service to user. They have positive beliefs on the availability of Commute Greener! even if the system is running under the condition of having a interrupted risk from internet provider. But turning to the individuals' answers, it suggests that Commute Greener! mobile-client is not compatible with various platforms other than Iphone, which against the objective of Commute Greener!--a cross-platform system[see section Commute Greener!]. And still, some users made negative comments on usability of Commute Greener! on both mobile-client and web-client. The same problem appeared at the Information Environment section.

Have you experienced any problems accessing Commute Greener?			
Answer Options	Yes	No	Response Count
Forgetting your username	24	101	125
Forgetting your password	24	101	125
Slow connection	20	105	125
Broken links	10	115	125
Other (please specify)			25
<i>answered question</i>			125
<i>skipped question</i>			6

Table11: Q12, is tagged to "Dependability" at the dimension of "System" of the appreciative trust model.

4.4 Person

According to the appreciative trust model, individual's trusting behavior contend that the readiness to trust is shaped by specific development and social contextual factors[2]. This dimension contains two factors:

- **Tendency To Trust(TTT):** It is aim to investigate respondent's TTT. An individual's decision to trust is dependent on individual's specific personality characteristics, the intrinsic trusting nature[2].
- **Computer Self Efficiency:** Questions assesses both web-client and mobile-client. Q15 and Q16 are depended.

4.4.1 Tendency To Trust

Q13 and Q14 are given to inquire respondent's personality characteristics. Do respondents have willing to trust other? Do they have positive belief to humanity? The answers of these questions are also used to verify the correctness of this survey.

There are totally 111 valid respondents have been calculated. In Q13, as can be seen, 103 (18+67+18=92%) of the respondents have generic faith in humanity. In Q14, 108 (17+60+31=97%) of the respondents are willing to trust

people in their personalities.

As discussed in general characteristics section, 96% of the respondents think Commute Greener! is trustworthy. Together with the result from Q13 and Q14, the theory of Tendency To Trust(TTT) is verified. Kini says people meet novel situation, if they have higher TTT, then they are more willing to trust others is true[2]. And also users of Commute Greener have higher TTT, thus they intend to trust the system.

I generally have faith in humanity.							
Answer Options	strongly agree	agree	partly agree	partly disagree	disagree	strongly disagree	Response Count
I do	18	67	18	4	4	0	111
<i>answered question</i>							111
<i>skipped question</i>							20

Table12: Q13, is tagged to "Tendency To Trust" at the dimension of "Person" of the appreciative trust model.

I generally trust other people unless they give me a reason not to.							
Answer Options	strongly agree	agree	partly agree	partly disagree	disagree	strongly disagree	Response Count
I do	17	60	31	1	2	0	111
<i>answered question</i>							111
<i>skipped question</i>							20

Table13: Q14, is tagged to "Tendency To Trust" at the dimension of "Person" of the appreciative trust model.

4.4.2 Computer Self Efficiency

Individual's computer self efficacy affects the easy of use perceptions. How do respondents think about the efficiency of web-client and mobile-client of Commute Greener!? What could hinder their decision to use mobile-client?

In Q15, it shows that 61% of the respondents use only web-client to access Commute Greener!. Not surprisingly, because comments from open-ended answers at Q12 and Q4 state that mobile-client is not compatible with their mobile phones. What's more, As can be seen in Q16, 46% of the respondents confirm the problem of the platform. Additional 30% of the respondents do not want to spend more money on mobile internet traffic. In the open-ended answers, user1 "I did not find the application easy enough to use." user2 "Can not get it

to work on my blackberry¹⁶." user3 said:"Currently have no internet access on phone, even if the phone would allow it."

The analysis above suggests that there are three major issues of mobile-client, which are portability, internet availability, and traffic expenses. Those issues hinder user's confidence to the mobile-client. Together with the results from Q4 and Q12, they suggest that portability of mobile-client need to be improved.

Do you use both computer and mobile phone to access Commute Greener?		
Answer Options	Response Percent	Response Count
Yes (then move to question №22)	38,2%	29
No, I only use computer	61,8%	47
<i>answered question</i>		76
<i>skipped question</i>		55

Table14: Q15, is tagged to "Computer Self Efficiency" at the dimension of "Person" of the appreciative trust model.

Why don't you use your mobile phone to access Commute Greener? (you may choose more than one alternative)		
Answer Options	Response Percent	Response Count
I don't want to spend money on Commute Greener mobile phone application	15,4%	6
I don't want to spend money on my mobile internet access	30,8%	12
My mobile phone is not suitable (is out of date; is too small etc.)	46,2%	18
I don't think I need it	35,9%	14
Other (please specify)		15
<i>answered question</i>		39
<i>skipped question</i>		92

Table15: Q16, is tagged to "Computer Self Efficiency" at the dimension of "Person" of the appreciative trust model.

¹⁶ A type of smartphone, which could support web reading. www.blackberry.com.

4.5 Task

The task of Commute Greener! is to reduce global and personal CO2 footprints. It provides personal CO2 calculator and a sharing platform[see Commute Greener!]. In this dimension, Q18 is used to know the trend of the number of users, which is helpful to understand the result of the survey.

- **Risk in involve:** This factor is used to measure the potential risks when respondents were using functionality on Commute Greener!. And how user perceive risks involved in.

4.5.1 Risk In Involve

Do user of Commute Greener! consider risk of security is their main concern? Do user willing to share their experience with others? The fundamental question Q2 has been analyzed[see General Characteristics]. By knowing the result from Q2 and Q11, it can be concluded that most respondents feel the risk of using Commute Greener! is lower than their requirements. And users of Commute Greener! do not think it is risky to hand over their commute patterns.

In Q17, 110 of the respondents have been calculated. Q17 shows 67% of the respondents were not willing to sharing their experience by using Commute Greener!. It is not a expected result which aganist the objective of Commute Greener!. Additionally, Farkas describes social software can be syndicated, shared, reused, or remixed, or it facilitates syndication[7]. However, users perceive Commute Greener! as a closed system which means they might only appreciate the thinking of protecting environment provided by Commute Greener!. But they do not desire to spread this appreciation into this community. As is indicated in Q18, Commute Greener! have successfully kept most of respondents. But considering the limited number of respondents who answered Q18. And still 40% of the respondents have already decided to leave, thus it can barely say that the number of users will not drop off in future.

I would like to share more personal results/experience with other members.		
Answer Options	Response Percent	Response Count
Yes	32,7%	36
No	67,3%	74
<i>answered question</i>		110
<i>skipped question</i>		21

Table16: Q17, is tagged to "Risk In Involve" at the dimension of "Task" of the appreciative trust model.

I am interested in continuously visiting this Commute Greener community.		
Answer Options	Response Percent	Response Count
Yes	59,1%	65
No	40,9%	45
<i>answered question</i>		110
<i>skipped question</i>		21

Table17: Q18, is tagged to "Risk In Involve" at the dimension of "Task" of the appreciative trust model.

4.6 Profound Analysis

The presumptive challenge to enable people to trust an online community is to provide a competent, dependable, and security system[2]. As can be seen from collected data, generally, respondents have positive beliefs[see Method for the calculation formula] in competence, security, dependability of Commute Greener!. This result proves the definition of the appreciative trust model is applicable in Commute Greener!. And also it has been successfully tested through four dimension of the trust model(Information Environment, System, Person, Task)[see Related Research]. The appreciative trust model is successfully applied in Commute Greener! to measure trust. On the other hand, there are some contradictions appear in this survey. Presuming those feedback are unbiased, 73% of the respondents did not use blog of Commute Greener!, and 63% of the respondents do not want to share their experience with others. Still 59% of the respondents are continuously interested in visiting the Commute Greener!, and this facts, are puzzling.

Yet, users of Commute Greener! think the system is trustworthy. In theory, the appreciative trust model does not included the dependent relation among those four dimensions. In this case, it could be considered in two explanations: (1) Users may trust the system, even if it provides a unattractive user interface and unuseful blog information, as long as they think it is working. Thus, it is the perception of how it is the way to protect environment, not the operation of system, that matters. This can be called individual's Tendency To Trust(TTT). It is interpreted to perception of protecting environment, in this case. (2) Even though Commute Greener! is not trustworthy and the facts is inconsistent with the empirical data, it may successfully gain trust from users if it is strongly recommended by Volvo group, through mass media, intranet, seal of approval, mandatory rules etc. This trust is brought from organization, when the effectiveness of organization is significant, it makes up for the lack of other factors.

Additional, from open-ended question Q4, Q12 and Q16, most user state clearly that both web-client and mobile-client are not user-friendly. And even the mobile-client is not

compatible with diverse platforms other than iPhone. Those problem results to the ineffectiveness of those seven core functions, as can be seen the result of Q4. The results suggest developers of Commute Greener! should improve the usability and portability, and prioritize them as most important quality attributes in Commute Greener!.

5 Conclusion

Trust is significant in social software and related research have contributed a lot to reputation mechanisms, such as reputation system in e-commerce. The objective of this research is to explore how trust is built in social software. To answer this question, a survey has been conducted and a discussion has contributed to results. The analysis suggests that:

- The appreciative trust model can be used to study various types of social software and measure trust, in this case, an online community involving personal data. The results shows most respondents (96%) believe Commute Greener! is trustworthy, more over, respondents have a positive beliefs in the competence, security and dependability of the system under the condition of risk.
- The four dimensions of the appreciative trust model do affect user's trust in an online community. Further more, I speculate that there are potential relations among those four dimensions (Information Environment, System, Person, Task) in terms of the appreciative trust model. Although it is missing in the theory of the appreciative trust model. In this case, individual's high tendency to trust (TTT) together with reputation of Volvo, this two factors make up for the lack of trust from the other dimensions.

Also, it is interesting to speculate whether Commute Greener! would be better off if usability of the client sides, and portability of mobile-client could be improved. Thereby, users can better share their interests, personal CO2 footprint, and experience of environmental care. Finally, to attract more users to actively contribute to an online community, it is essential to cultivate people's real interests rather than relying on the reputation of a specific organization.

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