Requirement Engineering for Traffic Information Application Using GPS Based on Motivations to Contribute

by Mgs Afriyan Firdaus

Submission date: 01-Apr-2023 05:03PM (UTC+0700)
Submission ID: 2052798440
File name: 2019_-_ICECOS_2019.pdf (397.71K)
Word count: 2877
Character count: 15460

International Conference on Electrical Engineering and Computer Science (ICECOS) 2019

Requirement Engineering for Traffic Information Application Using GPS Based on Motivations to Contribute

Rahmat Izwan Heroza
Department of Information Systems
Universitas Sriwijaya
Ogan Ilir, Indonesia
rahmatheroza@unsri.ac.id

Mgs. Afriyan Firdaus
Department of Information Systems
Universitas Sriwijaya
Ogan Ilir, Indonesia
afriyan.firdaus@unsri.ac.id

Ali Ibrahim
Department of Information Systems
Universitas Sriwijaya
Ogan Ilir, Indonesia
aliibrahim@unsri.ac.id

Abstract—This study identified the motivation to contribute traffic information based on the theory of Helping Behaviour using quantitative research methods and questionnaires as data collection method. Samples were randomly selected from 100 drivers in the city of Palembang. Data analysis was performed using Structural Equation Modelling technique with the help of SmartPLS application, indicating that the hypothesis which are variables from Helping Behaviour theory i.e. attention, evaluation and impetus to respond, will influence the motivation of someone's contribution, all of the hypothesis are accepted with T Statistics values of 2.165, 2.883 and 2.892 respectively. From these three variables, this study do requirement engineering to proposes features for traffic information sharing applications based on user generated content, namely Need for Help, We are One, Top Contributor, Like, Share, Point and Redeem, Periodic GPS, and Privacy.

Keywords—requirement engineering, GPS, user generated content

I. INTRODUCTION

Information is a necessity for everyone. With current IT developments, information dissemination can be done more easily and more widely. Including traffic information, IT can enable the distribution of traffic conditions to other drivers more easily. IT also provides new opportunities for the system through user-generated content (UGC) so that data collecting will be much easier. Systems with this base, have a large number of contributors who are not formally bound to the organization. This is because most of these contributors work voluntarily without being paid. Wikipedia is one example of a large system with a UGC base. Most content on this online encyclopedia portal is written by free contributors without being paid. currently, Wikipedia already has more than 40 million articles in 290 different languages [1].

Paper in [2] concludes there are a number of things that motivate users so they want to contribute in the form of content creation, updating or other things. Some of the most important examples of motivation are the desire to be appreciated by others, a sense of curiosity, and a sense of wanting to help others. Research by [1] then classifies motivations into several levels, one level must be passed before heading to the next level, which they call stage theory.

Furthermore, traffic conditions can be determined more easily using GPS. This is because more and more smartphones that support the GPS feature produced and sold nowadays [3]. As examples, researches by [4], [5] and [6] use GPS data from vehicles to analyze traffic information. However, on the other hand, continuous use of GPS on smartphones will drain battery power and increase the cost of data transmission [7] [8] [9] which will demotivate users

Many studies suggest that failures in the information system (IS) development occur due to problems with the requirement engineering (RE) process [10]. RE concerned with the real-world goals for, functions of, and constraints on software systems [11] so that many researchers do RE to optimize system developed in any field, such as higher education [12], software industry [13] and health [14].

This study uses a requirements engineering approach to identify the motivation to contribute traffic information includ-ing GPS data and then proposes features that represent these motivations. The structure of this paper starts with discussing the research method in the next chapter, then presents the results and discuss them in chapter 3, and finally end it with a conclusion in the last chapter.

II. METHOD

A. Defining motivation based on theory

The first step in this study is to determine the motivations that will be used as the basis of the hypothesis for someone's motivations to contribute to the User Generated Content-Based Traffic Information Sharing Application, which we choose from proven theory which is widely used in information systems research. The theory we choose is the theory of Helping behaviour which has several factors [15], namely:

- attention. This factor states that the contributing party knows that there are parties who need for help.
- impetus to respond. This factor states that the contributing parties have the urge to respond in the form of social responsibility or the desire and sense of being able to contribute.
- Evaluation. This factor states that the contributing party will evaluate the factors that might prevent him from contributing or push him and also what efforts are needed for contributing.

B. Make hypothesis

The Helping Behaviour Theory states that these factors will have an impact on one's motivation to contribute. Based on the factors in this theory, we then define the hypothesis in

the form of variables that explain these factors as things that will influence motivation.

C. Data collection and analysis

The next step is to spread the questionnaire instruments to the sample of population which then the results will be analyzed using descriptive and inferential statistical methods to determine the variables and hypotheses that are accepted.

D. Recommendation

The final step of this research is to use the results of the analysis as a basis for giving recommendations in the form of features of traffic information sharing applications based on user generated content.

III. RESULT

A. Hypothesis Formulation

Based on the theory that has been chosen, the hypothesis is made based on existing factors that are thought to be positively related to Motivation (Y).

The first factor is attention (X1). This factor states that the contributing party knows that there are parties who need help. H1: User who knows that a program requires contributions will contribute

The second factor is Impetus to respond (X2). This factor states that the contributing parties have the urge to respond in the form of social responsibility or the desire and sense of being able to contribute. H2: Users who feel socially responsible and feel able to contribute will contribute

In this study, we describe this factor into two sub-factors, namely shared ideology (X21) and expertise domain (X22). The last factor is Evaluation (X3). This factor states that the contributing party will evaluate the factors that might encourage or prevent him from contributing. H3: Users will contribute if there are driving factors and the absence of obstacles in contributing.

In this study, we describe this factor into five sub-factors namely existence (X31), rewards (X32), battery usage (X33), internet usage (X34), and privacy (X35).

B. Evaluate The Outer Model

a) Validity Testing: The questionnaire was distributed online to 100 drivers in the city of Palembang, then the data was processed using smartPLS using PLS analysis and bootstrapping. All indicators have a loading factor of more than 0.5 so that they can explain latent constructs [16] while the smallest value of 0.640 for the X31d indicator (I will share the GPS on my LBS so that my location is known to my friends). This shows the selected indicators are valid or have met convergent validity. A diagram of loading factors for each indicator can be seen in Fig. 1.

b) Reliability Testing: The results of reliability testing for all variables in the form of composite reliability values from the indicator blocks that measure constructs can be seen in Table I.

TABLE I. COMPOSITE REALIABILITY FOR EACH VARIABLE > 0.7

	Composite reliability
Attention	0.955
Battery	0.821
Evaluation	0.845
Existance	0.872
Expertise	1.000
Impetus to respond	0.750
Internet	0.943
Motivation	0.804
Privacy	0.748
Rewards	0.968
Shared ideology	0.842

Table I shows that the composite reliability value for all constructs is above 0.7 which indicates that all constructs in the model estimated meet the criteria of discriminant validity. The lowest composite reliability value is 0.748 in the Privacy construct.

c) Evaluate The Inner Model: After the estimated model meets the outer model criteria, then the structural model (Inner model) is tested. The results of hypothesis testing with path coefficient can be seen in Table II while the total effect results indirectly for each variable on motivation can be seen in Table III.

TABLE II. PATH COEFFICIENT FOR EACH HYPOTHESIS > 1.96

	Original Sample	T Statistics
Attention ! Motivation	0.212	2.165
Impetus to respond ! Motivation	0.280	2.883
Evaluation ! Motivation	0.276	2.892

Table II shows that the relationship between Attention and Motivation is significant with a T-statistic of 2,165 (>1.96). The original value of the sample estimate is positive which is equal to 0.212 which indicates that the direction of the rela-tionship between Attention and Motivation is positive. Thus the H1 hypothesis in this study which states that "Users who know that a program requires contributions will contribute" is accepted.

Table II shows that the relationship between Impetus to Respond and Motivation is significant with a T-statistic of 2.883 (>1.96). The original value of the sample estimate is positive which is equal to 0.280 which indicates that the direction of the relationship between Impetus to Respond and Motivation is positive. Thus the H2 hypothesis in this study states that 'Users who feel socially responsible and feel able to contribute will contribute' is accepted.

Table II shows that the relationship between Evaluation and Motivation is significant with a T Statistic of 2.892 (>1.96). The original sample estimate value is positive which is equal to 0.276 which indicates that the direction of the relationship between Evaluation and Motivation is positive. Thus the H3 hypothesis in this study which states that "Users will contribute if there are driving factors and the absence of obstacles in contributing" is accepted.

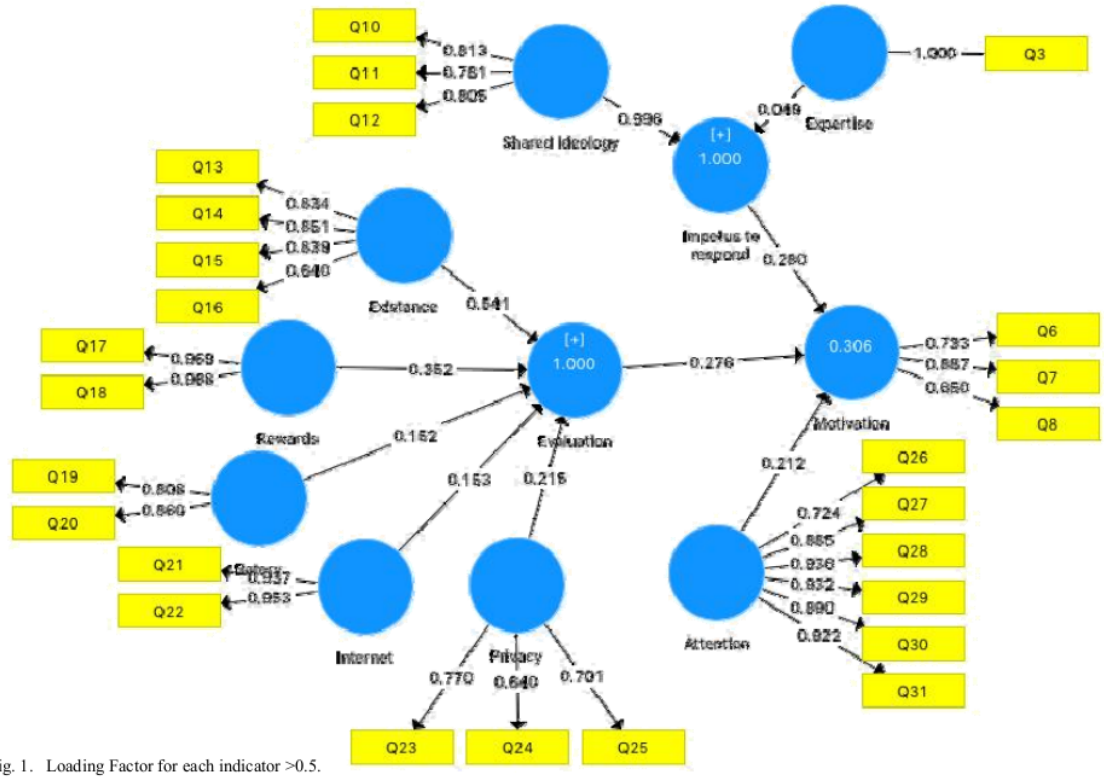

Fig. 1. Loading Factor for each indicator >0.5.

TABLE III. TOTAL INDIRECT EFFECTS

	T Statistics
Battery ! Motivation	2.099
Existance ! Motivation	2.389
Expertise ! Motivation	0.482
Internet ! Motivation	1.407
Privacy ! Motivation	2.489
Rewards ! Motivation	2.344
Shared Ideology ! Motivation	2.818

Table III shows that of the seven variables which indirectly rrelate to motivation variables, only 2 variables are rejected, namely expertise variable with T-statistic of 0.482 and internet variable with T-statistic of 1.407, where both T-statistics value is less than 1.96. Thus, this study states that the internet does not become a consideration for users to contribute and the frequency of user traveled does not affect motivation in contributing to the program. The structural equation between variables in the form of path coefficients is can be seen in (1).

$$Y = 2{:}16X1 + 2{:}883X2 + 2{:}892X3 \qquad (1)$$

IV. RECOMMENDATION

Based on the structural model produced, this study proposes several recommendations in the form of a set of software requirements as an application features to share traffic infor-mation based on attention, impetus to respond, and evaluation variables.

A. *Need Help*

Attention variable indicates that someone will be moved to contribute if he knows there are certain parties who need his help. From here, a Need Help feature can be created, which will recommend parties who need information on traffic conditions such as friends, superiors or other parties that are tailored to each user profile [17].

B. *We are one*

The Shared Ideology variable indicates that someone will be moved to contributes if he feels that he shares the same ideology with the program. From here, we can make a feature We are one, which shows the identity of the program that has been confirmed to be the same as the identity of the user of the application whose contribution is expected.

C. Top Contributor, Like and Share

Variable existance indicates that someone will be moved to contribute if he gets recognition from others or to be known by others. From here, a Top Contributor, Like, as well as Share to Social Media feature can be created that will display the highest ranking user contribution, like and share to social media features to show user involvement to more people [18].

D. Point and Redeem

Variable rewards indicate that someone will be moved to contribute if he gets a prize or award because of the contribution he made. From here, a Point and Redeem feature can be made that will give points from every contribution that has been made as financial incentives for users [19] [20] [21] [22] where users will be able to exchange these points with a prize.

E. Customized GPS Transmission

Variable battery indicates that someone is not interested to contribute by giving the GPS location to the program because he does not want the battery to run out quickly due to GPS features. From here it can be implemented a location detection mechanism for users to use GPS periodically where GPS data retrieval is only done when the device moves [7] or based on zone [9], and the use of GPS accuracy that is not too large [8].

F. Privacy

Privacy variables indicate that someone is not interested to contribute by giving the GPS location to the program for fear that privacy will be leaked. From this it can be implemented a feature that will notify users about the confidentiality of the data they provide to the program. The overall recommen-dations of the traffic information sharing application features based on user generated content can be seen in table IV.

V. CONCLUSION

This research has succeeded in building a model construction used in investigating variables that influence traffic information sharing behaviour, with conclusions as follows:

- Users who know that a program requires contributions will contribute
- Users who feel socially responsible and feel able to contribute will contribute
- Users will contribute if there are driving factors and the absence of obstacles in contributing
- The internet is not a consideration for users to contribute
- The frequency of user travel does not affect the motivation to contribute
- Features proposed for traffic information sharing applications based on user generated content, namely Need for Help, We are One, Top Contributor, Like, Share, Point and Redeem, Periodic GPS, and Privacy

TABLE IV. PROPOSED APPLICATION FEATURES

Variable	Feature	Description
Attention	Need for Help	display parties who need information on traffic conditions such as friends and superiors
Shared Ideology	We are one	shows the identity of the program that is the same as the user
Existance	Top Kontributor	display ranking of users with the highest contribution rate
Existance	Like	express like for a particular post
Existance	Share	share user activities to social media
Rewards	Point and Redeem	give points from each contribution that can be exchanged for prizes
Battery	Periodic GPS	take GPS on a certain period or a certain zone
Privacy	Privacy	guarantee the confidentiality of user data

REFERENCES

[1] K. Crowston and I. Fagnot, "Stages of motivation for contributing user-generated content: A theory and empirical test," Int. J. Hum. Comput. Stud., 2018.

[2] A. P. Ghaisani, P. W. Handayani, and Q. Munajat, "Users' Motivation in Sharing Information on Social Media," Procedia Comput. Sci., 2017.

[3] L. Montini, S. Prost, J. Schrammel, N. Rieser-Schussler," and K. W. Axhausen, "Comparison of Travel Diaries Generated from Smartphone Data and Dedicated GPS Devices," Transp. Res. Procedia, vol. 11, pp. 227–241, Jan. 2015.

[4] Z. Kan, L. Tang, M.-P. Kwan, C. Ren, D. Liu, and Q. Li, "Traffic congestion analysis at the turn level using Taxis' GPS trajectory data," Comput. Environ. Urban Syst., vol. 74, pp. 229–243, Mar. 2019.

[5] N. Chankaew, A. Sumalee, S. Treerapot, T. Threepak, H. W. Ho, and W. H. K. Lam, "Freight Traffic Analytics from National Truck GPS Data in Thailand," Transp. Res. Procedia, vol. 34, pp. 123–130, Jan. 2018.

[6]

[7] E. D'Andrea and F. Marcelloni, "Detection of traffic congestion and incidents from GPS trace analysis," Expert Syst. Appl., vol. 73, pp. 43–56, May 2017.

[8] T. O. Oshin, S. Poslad, and A. Ma, "Improving the Energy-Efficiency of GPS Based Location Sensing Smartphone Applications," in 2012 IEEE 11th International Conference on Trust, Security and Privacy in Computing and Communications, 2012, pp. 1698–1705.

[9] L. A. Tawalbeh, A. Basalamah, R. Mehmood, and H. Tawalbeh, "Greener and Smarter Phones for Future Cities: Characterizing the Impact of GPS Signal Strength on Power Consumption," IEEE Access, vol. 4, pp. 858–868, 2016.

[10] S. Barbeau et al., "Dynamic Management of Real-Time Location Data on GPS-Enabled Mobile Phones," in 2008 The Second International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies, 2008, pp. 343–348.

[11] R. Govindaraju and B. Wiradanti, "Factors influencing the willingness to implement requirement engineering good practices," Int. J. Bus. Inf. Syst., vol. 19, no. 3, p. 279, 2015.

[12] P. A. Laplante, Requirements engineering for software and systems, second edition. CRC Press, 2014.

Requirement Engineering for Traffic Information Application Using GPS Based on Motivations to Contribute

ORIGINALITY REPORT

15%	14%	13%	12%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.ijeast.com Internet Source	6%
2	Submitted to Chittagong University of Engineering and Technology Student Paper	2%
3	eudl.eu Internet Source	2%
4	Visa Musa Ibrahim, Zulkurnain Abdul-Malek, Nor Asiah Muhamad, Mohammed Imran Mousa et al. "Sulphur hexafluoride gas decomposition products of fixed metallic defect in coaxial gas insulated switchgear", 2017 International Conference on Electrical Engineering and Computer Science (ICECOS), 2017 Publication	1%
5	Submitted to Universitas 17 Agustus 1945 Surabaya Student Paper	1%
	Submitted to University of Sunderland	

6	Student Paper	1 %
7	www.researchgate.net Internet Source	1 %
8	Shehnila Zardari, Rami Bahsoon. "Cloud adoption", Proceeding of the 2nd international workshop on Software engineering for cloud computing - SECLOUD '11, 2011 Publication	1 %
9	ijarm.com Internet Source	1 %

Exclude quotes	On	Exclude matches	< 1%
Exclude bibliography	On		