EXPLORING THE EFFECTS OF SOCIAL INFLUENCE ON USER BEHAVIOR TARGETED TO FEEDBACK SHARING

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ABSTRACT

The development of networked digital economy keeps opening up new ways for social interactions and interpersonal influences. Drawing upon social sciences theories and the Persuasive Systems Design (PSD) model, this paper explores the effects of social influence design principles on altering user behavior toward engagement in feedback sharing. A theory-driven research framework is composed to underpin the designing of a Twitter-based information system with persuasive social influence features, such as cooperation, competition, recognition, social learning, and social facilitation at its core. Based on a pilot experimental study involving 37 users of the system, the findings indicated several positive effects of the aforementioned persuasive software features. First, cooperation was more salient for active tweeters and users who perceive Twitter as an influential tool. Second, social learning indicated an impact on users with shorter Twitter experience, and together with cooperation, they both demonstrated stronger effects on user behavior when combined with recognition rather than competition. Third, social facilitation presented more significant effects on users who tweet more frequently. Fourth, the results of this pilot study demonstrated considerable persuasive powers of recognition in the design of systems targeted to feedback sharing. This initial pilot study provides valuable input for further research related to social influence on user behavior, and it highlights several useful aspects for designers of persuasive systems.

KEYWORDS

Social Influence, User Behavior, Feedback, Twitter

1. INTRODUCTION

The rapid evolution of information and communication technologies and the emergence of the social web have developed new ways for social interaction and networking. Furthermore, the Internet has become increasingly mobile, thus influencing various aspects of everyday life by changing human behaviors and habits in both the virtual world and physical space. According to Oinas-Kukkonen (2012), the contemporary web has opened and will keep opening up a myriad of opportunities for the development of new kinds of information systems aimed at altering user behavior. Hence, the demand for behavioral studies in the context of information systems related to social interaction through modern media channels has notable potential for natural growth over the coming years.

Socio-technical systems (Ropohl, 1999) have been commonly designed for both explanation and facilitation of the aforementioned impacts of technology on society. Common public environments, such as airports, when enriched with such systems, may not only encourage active participation and contribution (Mumford, 1987), but also introduce new challenges for businesses in redesigning their customer relationships. Previous research has emphasized the necessity of developing customer-supplier relationships through dialog and interaction (Payne et al., 2008), and via customer involvement in feedback sharing (Mangold and Faulds, 2009), particularly.

The review of earlier studies about public socio-technical environments revealed that many of them have been merely focused either on social interaction using public and private screens (Choi and Seeburger, 2011) or on behavior change altered by interactive environments (Mathew, 2005). Therefore, the generic direction of this study is to explore how people located in public places can be influenced through information systems

to change their behavior targeted to feedback sharing. Moreover, Burnkrant and Cousineau (1975) have pointed out that one of the most pervasive determinants of an individual's behavior is the influence of those around him. Thus, the very focus of this study is to examine the effects of social influence mediated and facilitated by information systems in the setting.

The research field that focuses on studies related to behavior and attitude change facilitated by computing devices is called persuasive technology (Fogg, 2003), and the socio-technical information systems aimed at changing people's behaviors and attitudes within this stream of research are called behavior change support systems (BCSSs) (Oinas-Kukkonen, 2010; Oinas-Kukkonen, 2012). BCSSs influence behaviors and attitudes of users by building upon their motivation or goal. Technology–mediated and technology–human persuasion are typically exercised by BCSSs (Lehto et al., 2012). This paper describes a combination of both types of persuasion, since it inspects the effects of social influence mediated by an information system.

In particular, the concept of BCSSs provides researchers and system developers with sharper conceptual–theoretical means for conducting research on and developing information systems aimed at behavioral or attitudinal changes. Within the concept, a significant role in designing and evaluating BCSSs is played by the Persuasive Systems Design (PSD) model, which also provides a framework for analyzing the persuasive potential of information systems (Oinas-Kukkonen and Harjumaa, 2009).

In this study, five persuasive system features from the social influence category of the PSD model—cooperation, competition, recognition, social learning, and social facilitation—are designed and implemented in a Twitter-based information system in order to study their effects on user behaviors. The objective of this study is to explore the effects of the aforementioned social influence features on user perceptions about the system and behavioral intentions. Studies of this kind are highly relevant, as they advance the design of future information systems (Loock et al., 2011).

The paper is structured as follows. The next section covers a review of related research, whereupon a theory-driven research framework is developed. The research methodology is described in section 3. The data analysis and results follow in section 4. Section 5 covers the discussion of findings, and section 6 ends the paper with conclusions.

2. RELATED RESEARCH AND FRAMEWORK DEVELOPMENT

Ryan and Deci (2000) have stated that human beings can be proactive and engaged depending largely on the social conditions in which they develop and function. In addition, Bandura (2001) has described that human self-development, adaptation, and change are embedded in social systems. In such systems, according to the social cognitive model, personal factors, behavioral patterns, and environmental events all operate as interacting determinants that influence each other (Bandura, 1986). In this study, the structure of the social cognitive model is adapted to explore the effects of personal and environmental determinants on the target behavior of users toward engagement in feedback sharing (Figure 1).

The reciprocal interplay between personal determinants (user factors) and behavioral determinants (user behavior) reflects the interaction among what people think, believe, and feel, as well as how they behave (Bandura, 1986). The social learning theory suggests that people are equipped with the capacity of observational learning, which increases their behavioral knowledge and skills by observing others, thus having a direct influence on their own behavioral intentions and consequent behaviors (Bandura, 1976). Further, the social cognitive theory proposes that successful, self-regulated individuals have higher motivation, exploit better behavioral strategies, and respond more appropriately to environmental influences (Bandura, 1991). Consequently, this study applies the constructs of self-regulation and observation to explore the effects of these user factors on user behavior.

The reciprocal interplay between user factors and software features portrays the interaction among human beliefs, emotions, and cognitive competencies, as well as how they are developed and modified by social influences conveyed through environmental factors (Bandura, 1986). Malone and Lepper (1987), in their previous research work, have described three interpersonal motivating factors—cooperation, competition, and recognition. The first two are driven by the human tendency to cooperate and compete, but the latter implies people's enjoyment of having their efforts and accomplishments recognized and appreciated by others. In many situations, these interpersonal factors provide important intrinsic motivation that would not be present in the absence of other people (Malone and Lepper, 1987). Another significant interpersonal

motivating factor is the principle of social influence described by Zajonc (1965). He suggests that the role of social facilitation is especially important to consider in social situations, because it implies that people's behavior can be greatly affected by the internal awareness of being watched or evaluated by others.

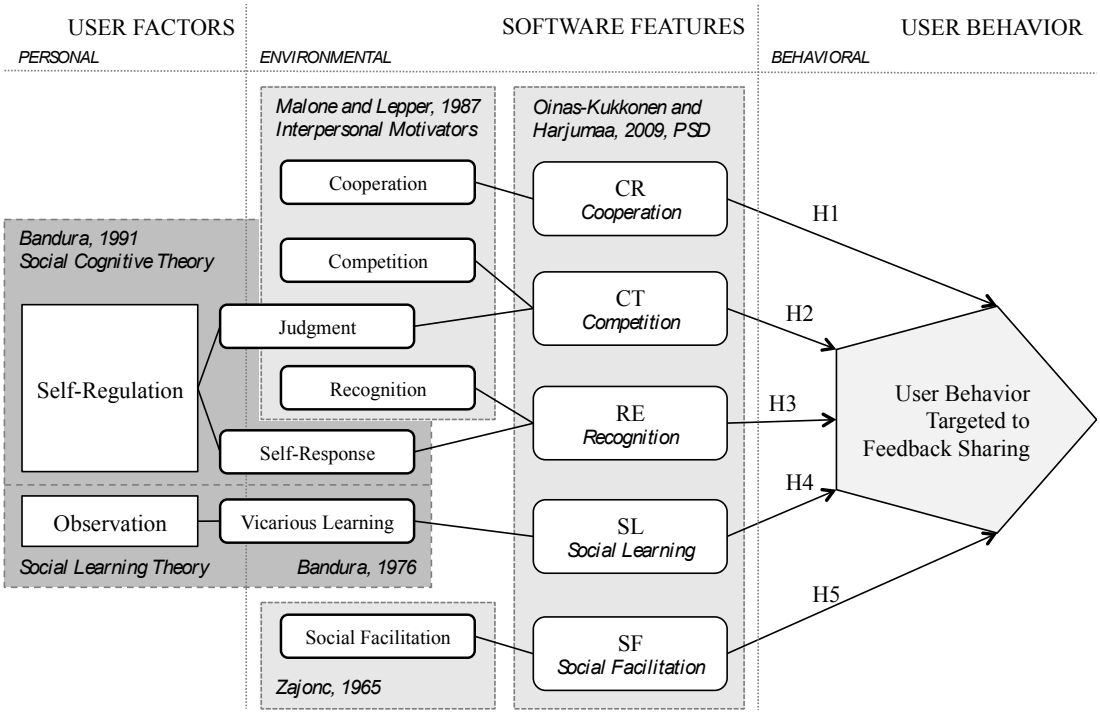

Figure 1. The Research Framework

In order to lock the loop of the triadic reciprocal causation, Bandura (1986) stresses that, in everyday interactions, user behavior alters environmental conditions and, in turn, is changed by the same conditions it creates. In addition, the social cognitive theory encourages the exploration of the aspects of social persuasion maintained by ambient environments. In the present study, the PSD model (Oinas-Kukkonen and Harjumaa, 2009) has been extensively applied to define the hypotheses below and to distinguish applicable persuasive design principles (i.e., persuasive software features) for social influence on user factors (i.e., self-regulation and observation) and user behavior to engage in feedback sharing. Five software features—cooperation, competition, recognition, social learning, and social facilitation—were selected from the social influence category of the PSD model based on their conformity to the previously depicted constructs.

The cooperation feature (CR) was selected because it expresses a similar essence of cooperation as that described by Malone and Lepper (1987). The CR feature can motivate users to adopt a target attitude or behavior by leveraging human beings' natural drive to cooperate. Therefore, hypothesis H1 is proposed: *An information system with an implemented cooperation feature has a positive effect on user behavior*.

The competition feature (CT) was selected because it reflects the principle of competition proposed by Malone and Lepper (1987), and it is grounded in the judgmental process of the self-regulation construct suggested by Bandura (1991). The CT feature can motivate users to adopt a target attitude or behavior by leveraging human beings' natural drive to compete. Consequently, hypothesis H2 is proposed: *An information system with an implemented competition feature has a positive impact on user behavior*.

The recognition feature (RE) was selected because it conveys the substance of recognition proposed by Malone and Lepper (1987), and it is grounded in the self-response process of the self-regulation construct described by Bandura (1991). Public recognition for an individual or group, a system can increase the likelihood that a person/group will adopt a target behavior. So, hypothesis H3 is proposed: *An information system with an implemented recognition feature has a positive influence on user behavior*.

The social learning (SL) feature was selected because it represents a similar concept as the vicarious learning capability, which originates from the principle of observational learning (Bandura, 1976). The SL feature implies that users will be more motivated to perform a target behavior if they can use a system to

observe others performing the behavior. Thus, hypothesis H4 is proposed: *An information system with an implemented social learning feature has a positive effect on user behavior*.

The social facilitation (SF) feature was selected because it conveys a similar idea as the social facilitation principle described by Zajonc (1965). The SL feature implies users are more likely to perform target behavior if they discern via system that others are performing the behavior along with them. Consequently, hypothesis H5 is proposed: *An information system with an implemented social facilitation feature has a positive effect on user behavior*.

3. RESEARCH METHODOLOGY

The research methodology was built upon four consecutive phases. The first phase was the development of theory-driven research framework, covered in the previous section. The second phase was dedicated to the design and implementation of an information system reflecting the attributes of the research framework. The third phase included interactive sessions, wherein participants used the system for some time, after which they were asked to provide responses to an online questionnaire. The data analysis, performed in the fourth phase, is reported in the next section.

3.1 System Description

For the purposes of this study, an information system was designed on top of the Twitter (twitter.com) service, which has been verified as effective for user engagement (Junco et al., 2011), persuasion (Young, 2010), and influence on actions outside the virtual world (Stibe et al., 2011). Twitter is an increasingly popular microblogging web service that allows registered users to post messages limited to 140 characters. The summary of the abovementioned characteristics underpins the reasoning behind the selection of the Twitter service as a platform for this study. The system was designed to facilitate a positive influence on people's intentions to engage in feedback sharing using the system, and it included a public interface designed for users (Figure 2) and an interface for an administrator to add questions.

Figure 2. The Public Interface of the System with the Recognition (*Left*) and Competition (*Right*) Features

When the system is activated, it displays a series of questions through the public interface, but users can provide their responses using Twitter on their smartphones or laptops. In addition, the system was complemented with the previously selected persuasive software features, especially separating the recognition and the competition features, because they both originate from the same theoretical construct of self-regulation (Bandura, 1991).

The layout of the public interface included a question, the related hashtag, all tweets containing this hashtag (the social learning feature), the number of active participants (the social facilitation feature), the sum of collected tweets (the social facilitation feature), and either a space for publicly recognizing

well-performing users (the recognition feature; Figure 2, left), depending on users' individual achievements in tweeting, or a list of top responders (the competition feature; Figure 2, right), containing the most active users. In the screenshots of the system, the web addresses and the usernames of participants were partially hidden due to concerns related to the identification of the system and participants.

3.2 Data Collection

A pilot study employing the system was conducted in a classroom setting, wherein participants were asked to pretend they were airline travelers waiting to depart at an airport. The output of the system was projected on a big screen in front of the group, and users responded via Twitter from desktop computers or mobile devices. The study was conducted for 30 minutes. Six questions related to airline travel issues were added to the system incrementally. At the beginning of the study, two questions rotated in a loop on the big screen. After ten minutes, another two questions were added, and after another ten minutes, the last two questions were added. The displayed information was automatically refreshed every 15 seconds.

All 37 participants in the pilot study were computer science students in a graduate program who were enrolled in a course about information and communication technologies and behavior change. The participants were randomly divided into two groups, and each group was placed in a separate computer room. One group, consisting of 18 people, interacted with the implementation of the system emphasizing recognition, and the other group, consisting of 19 people, operated with the implementation highlighting competition. Right after the hands-on session with the system, all users were required to fill in an online questionnaire. The survey instrument consisted of demographic questions and seven-point Likert scale items for assessing user perceptions, the first option being "strongly disagree," the last option being "strongly agree," and the middle option being "undecided."

3.3 Respondent Characteristics

Among the respondents, there were 24 males (64.9%) and 13 females (35.1%), mostly 20–29 years of age (87%, n=32). Most of the respondents had less than six months of experience using Twitter (73%, n=27), and they reported a positive attitude toward Twitter being an influential tool (70.3%, n=26). More details about respondent characteristics are summarized in Table 1.

Table 1. Respondent Characteristics

Demographics (N=37)	Value	Frequency	Percentage (%)
Gender	Female	13	35.1
	Male	24	64.9
Age	20–24 years old	5	13.5
	25–29 years old	21	56.8
	Over 30 years old	11	29.7

4. DATA ANALYSIS AND RESULTS

Nearly all respondents (92%, n=34) agreed that the system was useful for feedback collection, and the majority of the respondents (84%, n=31) thought the system effectively encouraged users to participate. As many respondents were positive about the ability of the system to increase user participation in developing or improving services provided by airports or airline companies. In addition, 73% of the respondents (n=27) believed, to some degree, that the system would work well in a real airport.

Tweets provided by others on the big screen encouraged many users (78%, n=29) to come up with their own tweets, and even more users (81%, n=30) perceived the displayed number of how many others were tweeting at the same time as a positive motivator. Of the respondents, 70% (n=26) perceived the goal of 100 tweets as a group task that required cooperation from all participants. The same number of respondents believed, to some degree, that Twitter is a powerful tool to call for action outside the virtual world. Furthermore, 73% of participants (n=27) saw themselves in the list of top responders or recognized with

special titles. A smaller number of participants (68%, n=25) responded positively that the displayed list of top responders or public recognition motivated them to improve their performance.

4.1 Comparing Users by Their Twitter Experiences

The normality of distribution throughout the dataset was verified using the stem-and-leaf method. All questions that failed to meet the normality requirements were withdrawn from the dataset before conducting the subsequent analysis, which was carried out using an independent samples t-test provided by SPSS (Statistical Package for the Social Sciences) statistical software. The independent t-test involves examination of the significant differences on one factor or dimension between means of two independent groups. The SPSS t-test procedure allows the testing of *t-value* and provides the relevant descriptive statistics.

The t-test analysis uncovered several findings about the effect of Twitter experiences on other dimensions of the present study. The comparison of the responses given by respondents who had been using Twitter for less than six months (73%, n=27) and respondents who had been using Twitter for longer than six months (27%, n=10) revealed three significant differences (Table 2).

Table 2. T-test Results for the Effect of the Length of Twitter Experience on the Dependent Variables

How long have you been using Twitter?	< 6 m	> 6 m	t-value	df	p-value
I tweet at least monthly on average.	1.30	2.00	-2.845	35	.007**
The content tweeted by others encouraged me to create my own responses.	4.78	3.20	2.747	35	.009**
I consider myself more than just a reader.	1.22	1.90	-2.584	35	.014*

*<6m=less than 6 months; >6m=more than 6 months; df=degrees of freedom; **p<.01; *p<.05*

Users with less Twitter experience were more affirmative that the content tweeted by others inspired them to create their own responses (t(35)=2.747, p=.009). This finding explicitly conveys the basic idea of social learning, and it appears to be more salient for users with less Twitter experience. Users with more Twitter experience were more inclined to agree that they consider themselves more than just readers (t(35)=2.584, p=.014) and that, on average, they tend to tweet more often (t(35)=2.845, p=.007) than less experienced Twitter users.

The comparison of the responses reported by participants who tweet at least monthly on average (35%, n=13) and those who never tweet or only sometimes (64.9%, n=24) revealed significant differences in responses to four questions (Table 3).

Table 3. T-test Results for the Effect of the Average Frequency of Tweeting on the Dependent Variables

I tweet on average:	ALM	NOS	t-value	df	p-value
Twitter is a powerful tool to call for action outside the virtual world.	5.85	4.38	4.228	35	.000***
The dynamic flow of tweets on the big screen made me feel like posting more tweets.	5.62	4.08	4.029	33	.000***
The displayed growing number of other active participants encouraged me to be more active in tweeting.	5.92	4.58	3.838	34	.001**
I felt more willing to post additional tweets as the total number of tweets got closer to the goal of 100.	5.31	4.04	2.406	35	.022*

*ALM=at least monthly; NOS=never or sometimes; df=degrees of freedom; ***p<.001; **p<.01; *p<.05*

Users who tweet more often on average were significantly more affirmative about Twitter being influential to call for action outside the virtual world (t(34)=4.228, p=.000), they had stronger beliefs that the dynamic flow of tweets on the big screen made them feel like posting more tweets (t(33)=4.029, p=.000), and that the displayed growing number of other active participants encouraged them to be more active in tweeting (t(34)=3.838, p=.001). The last two findings demonstrate significant effects of social facilitation on frequent tweeters. They also reported significantly more positive responses about willingness to post additional tweets when the total number of tweets got closer to the goal of 100 tweets (t(35)=2.406, p=.022), which implies the principle of cooperation.

The comparison of the responses given by participants who agreed about Twitter being an influential tool to call for action outside the virtual world (70.3%, n=26) and participants who disagreed to some extent

(16.2%, n=6) revealed that the first group felt a stronger willingness to post additional tweets when the total number of tweets got closer to the goal of 100 tweets (t(30)=2.574, p=.015). This finding accentuates a more significant influence of cooperation on the participants belonging to the first group.

4.2 Comparing Recognition and Competition as Persuasive Software Features

The t-test analysis comparing users who saw the recognition feature (48.6%, n=18) and those who saw the competition feature (51.4%, n=19) revealed that the first group of participants was significantly more affirmative regarding their feeling of willingness to post additional tweets when the total number of tweets got closer to the goal of 100 tweets (t(35)=2.680, p=.011).

The comparison of the responses (Table 4) given by participants from the recognition class (N=18) who had seen themselves on the big screen being recognized with special titles (72%, n=13) and the participants who had not (22%, n=4) revealed that the first group of participants felt more encouraged to come up with their own tweets based on the tweets of others (t(12)=3.323, p=.006), and that they felt more willing to post additional tweets as the total number of tweets got closer to the goal of 100 tweets (t(15)=2.848, p=.012). In contrast, the comparison of the responses given by participants from the competition class (N=19) who had seen themselves on the big screen in the list of top responders (74%, n=14) and the participants who had not (21%, n=4) revealed no significant difference in any of the aforementioned dimensions.

Table 4. T-test Results For The Effect Of The Dimension Of Whether Users Have Seen Themselves Recognized With Special Titles On The Dependent Variables

Have seen themselves recognized with special titles:		Yes	No	t-value	df	p
Tweets provided by others on the big display encouraged me to come up with my tweets.	Recognition	5.69	5.00	3.323	12	.006**
I felt more willing to post additional tweets as the total number of tweets got closer to the goal of 100.	Recognition	5.77	3.75	2.848	15	.012*

*Yes=have seen themselves; No=have not seen themselves; df=degrees of freedom; ***p<.001; **p<.01; *p<.05*

The findings described in this chapter provide support for the notion of increased persuasive capacity of the cooperation feature when combined with the recognition feature rather than the competition feature in such a setting.

5. DISCUSSION

The results of this pilot study provided evidence regarding several positive effects of the social influence design principles on user behavior targeted to feedback sharing. Almost all of the respondents considered this system useful for collecting feedback. Moreover, the majority of participants agreed that the system can effectively encourage users to participate, and that the system can increase user engagement in developing or improving services provided by airports or airline companies.

Initial data analysis revealed that tweets provided by others encouraged many users to come up with their own tweets. This finding implies the idea of learning from observing others performing the target behavior, thereby conveying the main idea of the theoretical construct of vicarious learning from the social learning theory (Bandura, 1976) and the related persuasive feature of social learning (Oinas-Kukkonen and Harjumaa, 2009). Thus, these findings provide support for hypothesis H4. Further, even more users perceived the displayed number of how many others were tweeting at the same time as a positive motivator. This finding is related to the theoretical construct social facilitation (Zajonc, 1965) and to the persuasive feature from the social influence category of the PSD model (Oinas-Kukkonen and Harjumaa, 2009) with the same name. Hence, this finding provides support for hypothesis H5.

Almost three-quarters of the respondents had seen themselves in the list of top responders or recognized with special titles, and more than two-thirds responded positively that the displayed list of top responders or public recognition motivated them to improve their performance. These findings are related to the interpersonal motivators suggested by Malone and Lepper (1987) and the social cognitive theory of self-regulation (Bandura, 1991), where the judgmental process supports the competition feature, implemented

here as the list of the top responders, and the self-response process supports the recognition feature (Oinas-Kukkonen and Harjumaa, 2009), implemented here as the public recognition with special titles. Thus, these findings provide support for hypotheses H3 and H2.

Finally, more than two-thirds of respondents perceived the goal of 100 tweets as a group task that required cooperation from all participants. This finding reflects the main idea of cooperation described by Malone and Lepper (1987) and conveys the principle of cooperation from the PSD model (Oinas-Kukkonen and Harjumaa, 2009). Therefore, support is provided for hypothesis H1 as well.

Summarizing the main effects of the examined social influence features, cooperation was more salient for active tweeters and users who perceived Twitter as an influential tool. Secondly, social learning indicated an impact on users with shorter Twitter experience, and together with cooperation, they both demonstrated stronger effects on user behavior when combined with recognition rather than competition. Thirdly, social facilitation presented more significant effects on users who tweet more frequently. Lastly, the results of this pilot study demonstrated considerable persuasive powers of recognition in the design of systems targeted to feedback sharing.

6. CONCLUSIONS

Drawing upon the social cognitive theory (Bandura, 1986), the social learning theory (Bandura, 1976), the taxonomy of intrinsic motivations for learning (Malone and Lepper, 1987), and the social facilitation theory (Zajonc, 1965), and combining those theories with the Persuasive Systems Design (PSD) model (Oinas-Kukkonen and Harjumaa, 2009), this paper has explored the effects of social influence design principles on altering user behavior toward engagement in feedback sharing.

For that purpose, a theory-driven research framework was developed and then analyzed, using the independent samples t-test. Then, five persuasive system features from the social influence category of the PSD model—cooperation, competition, recognition, social learning, and social facilitation—were designed and implemented in a Twitter-based information system in order to study their effects on user behaviors. A pilot experimental study involving 37 users of the system was conducted, and the main findings indicate several positive effects of the aforementioned persuasive software features on user perceptions and behaviors.

The developed and tested research framework is one of the key contributions of this study for scholars focusing on exploratory research related to social influence effects on user behavior, such as customer engagement in feedback sharing. On the other hand, businesses can gain immediate benefits by launching the system on their premises and collecting feedback from their customers.

Limitations of the study include the class setting, where users were able to watch others performing the behavior, and the narrow sample in terms of age and education, which limits the generalizability of the findings; however, the framework and concepts can be applied to other settings and contexts.

Further research should focus on improvement and testing of the initial research framework, as well as the refinement of the design elements for the examined persuasive software features. The system also needs to be tested in actual public places, such as airports, with various groups of participants and in different settings. However, this initial pilot study provides valuable input for further research related to social influence on user behavior, and it highlights several useful aspects for designers of persuasive systems.

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