Chapter 11
User Engagement in Feedback Sharing through Social Influence

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ABSTRACT

Organizations continuously strive to engage customers in the services development process. The Social Web facilitates this process by enabling novel channels for voluntary feedback sharing through social media and technologically advanced environments. This chapter explores how social influence design principles can enhance the effectiveness of socio-technical systems designed to alter human behavior with respect to sharing feedback. Drawing upon social science theories, this chapter develops a research framework that identifies social influence design principles pertinent to persuasive systems that facilitate user engagement in feedback sharing. The design principles are then implemented in an information system and their effects on feedback sharing are explored in an experimental setting. The main findings of this chapter contribute to research related to social influences on user behavior and to the practice of designing persuasive information systems.

INTRODUCTION

The rapid evolution of information and communication technologies and the emergence of the social web are continuously reshaping how businesses engage customers. Ever-growing connectivity not only provides new methods for organizations to retain existing customer relationships, but also enables novel approaches to providing rich customer engagement experiences (Payne et al., 2008). At the same time, customers are steadily developing an understanding of the spectrum of opportunities provided by emerging technologies. They acquire new habits of interaction and consumption, which then determine their expectations about how services are designed (Prahalad & Ramaswamy, 2003; Schlager et al., 2013). Customers increasingly demand products

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and services that match their needs and preferences (Moeller et al., 2013). Therefore, businesses seek opportunities to understand their customers' expectations (Mangold & Faulds, 2009). In other words, organizations need to reach their customers proactively and collect their feedback, and they need to provide ways for customers to interact with them that are convenient and immediate (Nambisan & Baron, 2009).

The Internet has become increasingly mobile and social over the last decade. Social media has rapidly expanded and businesses already use social media to develop relationships with their customers (The Nielsen Company, 2012). Today, people visit pages of organizations on Facebook or post tweets containing specific usernames of organizations on Twitter to provide instant feedback about their experiences with products and services (Jansen, 2009; Gummerus, 2012). These developments influence various aspects of everyday life by changing human behavior in both virtual and physical space. For example, people use social media more often through mobile devices. This broadens the potential for businesses to establish new forms of interaction with their customers as they move around. In addition, the situated displays that are often present in public places nowadays attract peoples' attention (Memarovic et al., 2012; Huang et al., 2008), facilitate interaction with them (Alt et al., 2013; Brignull & Rogers, 2003), and alter their behavior (Dalsgaard et al., 2011; O'Hara, 2003). This synthesis of social activity and technologically advanced environments forms an opportune channel for businesses to connect with customers and collect their feedback almost instantly. For example, organizations can post questions and concerns on public displays and people can use their social media accounts on smartphones to respond. Earlier research from similar environments has concentrated either on social interaction through public and private screens (Choi & Seeburger, 2011; Müller et al., 2010) or on behavior change due to interactive environments (Mathew, 2005; Jafarinaimi et al., 2005). The main focus of this study is to examine feedback-sharing behaviors facilitated through situated displays. In this particular setting, businesses can engage customers more naturally, as such interactions are completely voluntary (Nambisan & Baron, 2009). However, for the same reason, this setting also requires careful consideration of the mechanisms that influence people's motivation to participate.

This chapter seeks to identify the design principles that can harness social influence to engage people in sharing feedback. To accomplish that, the relevant background is outlined and a review of the related literature is provided. The primary purpose of this review is to share knowledge about the social influence principles that are relevant in the context of this study and to develop a theory-driven research framework. The secondary purpose of this review is to discuss how the said principles are interrelated and to what extent they explain users' perceptions about the effectiveness of socio-technical systems. Thus, the following research questions for this study are:

RQ1: Which social influence design principles are relevant for fostering user engagement in feedback sharing?

RQ2: How and to what extent do social influence design principles explain users' perceptions about the effectiveness of feedback sharing systems?

To answer these questions, this chapter presents a theoretical framework for identifying the social influence design principles pertinent for engaging people in feedback sharing, which further underpins a research model for assessing the effectiveness of feedback-sharing systems. Next, the chapter describes how the identified design principles are implemented in an information system, and their influence on feedback sharing is empirically tested with 37 users. Users' experiences with the system were measured through an online questionnaire and were analyzed with two statistical data analysis methods. Finally, the chapter concludes that the social influence design principles of cooperation, competition, recognition, social learning, and social facilitation have significant effects on user engagement in feedback sharing.

BACKGROUND

Persuasive Technology

Fogg (2003) argues that, compared to humans, computers can be more effective persuaders because of their capacity to maintain a high level of interactivity and to adjust influence tactics as situations develop. In addition, they can be more persistent, offer greater anonymity, manage huge volumes of data, display information in multiple ways, scale according to demand, and be accessed from almost everywhere. Technologies can be designed to alter human behavior in various contexts, such as health (Purpura et al., 2011), energy efficiency (Froehlich et al., 2010), the environment (Loock et al., 2011), learning (Mintz & Aagaard, 2012), and business (Yu et al., 2011). Technologies per se are not intended to influence users, but, through services that can be designed on top of them, they can facilitate behavior change and simplify the behavior change process (Lockton, 2012).

As an extension of Fogg's (2003) work, Oinas-Kukkonen and Harjumaa (2009) proposed the Persuasive Systems Design model, which described the key issues, the process model, and 28 design principles for developing and evaluating persuasive information systems. The model has previously been examined in various contexts (Oinas-Kukkonen, 2013) and findings have suggested that not all of the design principles should always be applied, but their selection should be based on a thorough understanding of a given problem domain and the underlying theories.

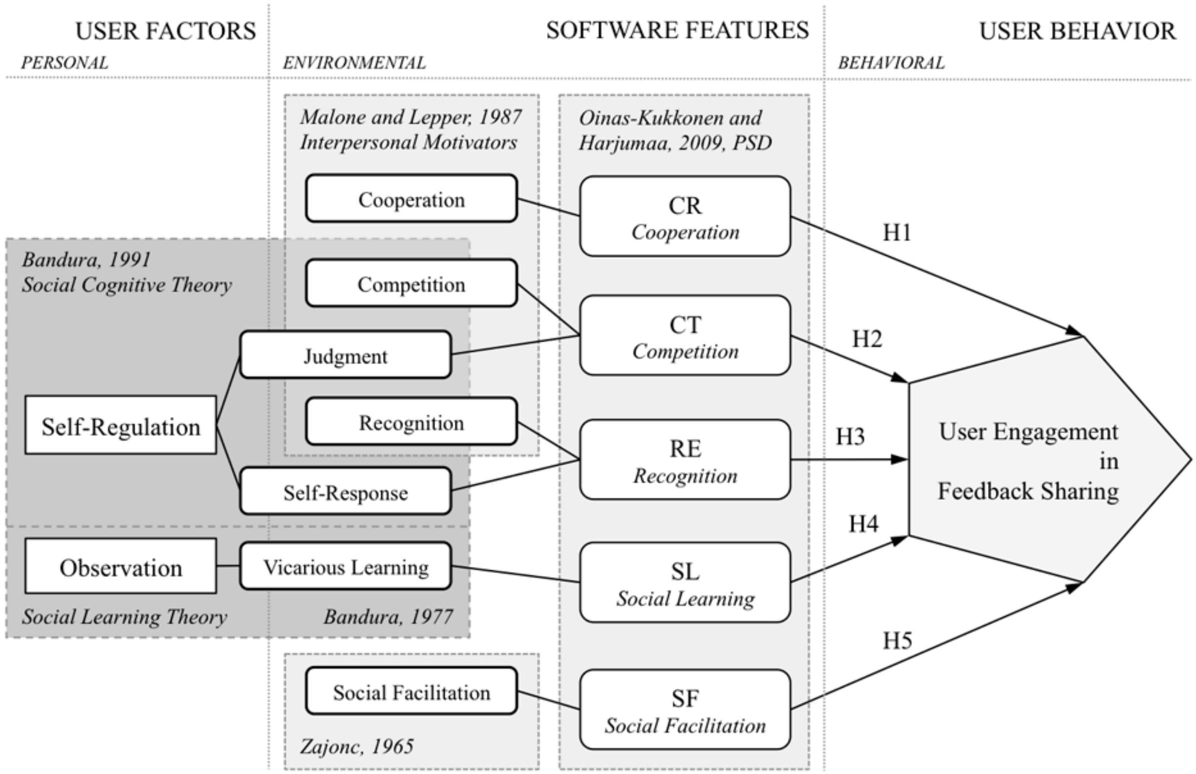
Oinas-Kukkonen (2013) suggested designing socio-technical systems that influence users' behaviors and attitudes by building upon their motivations or goals. Designing such systems requires understanding not only software and information systems, but also psychology.

Social Cognitive Perspective

Research in psychology suggests that human beings can be proactive and engaged depending largely on the social environments in which they develop and function (Ryan & Deci, 2000). Human self-development, adaptation, and change are embedded in social systems (Bandura, 2001). In such systems, according to the social cognitive theory, personal factors, behavioral patterns, and environmental events all operate as interacting determinants that mutually influence each other (Bandura, 1986). In other words, there is an endless dynamic interaction between the person, the behavior, and the environment in which a given behavior is performed. This triadic reciprocal determinism unfolds multiple pathways for studying behavioral change, including environmental and personal change. Therefore, it is adapted in this study to explore the effects of personal and environmental determinants on user engagement in sharing feedback (Figure 1).

The reciprocal interplay between personal determinants (user factors) and behavioral determinants (user behavior) reflects the interaction between what people think, believe, and feel, and how they behave (Bandura, 1986). In the context of social influence on peoples' behaviors, the social cognitive theory encourages us to look through the lens of two key human capabilities: observation and self-regulation. The former indicates that people are equipped with a capacity for vicarious learning, which increases their behavioral knowledge and skills by observing others, thus exerting a direct influence on their own behavioral intentions and subsequent behaviors (Bandura, 1977). The latter indicates that successful, self-regulated

Figure 1. Theoretical research framework



individuals have higher motivation, exploit better behavioral strategies, and respond more appropriately to environmental influences (Bandura, 1991).

The further interplay between user factors and software features portrays the interaction among human beliefs, emotions, and cognitive competencies, and how they are developed and modified by social influences conveyed through environmental factors (Bandura, 1986). Malone and Lepper (1987) suggested that social environments foster three interpersonal motivating factors: cooperation, competition, and recognition. The first two are driven by human nature to cooperate and compete, and the third signals peoples' 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 facilitation described by Zajonc (1965), who suggested that the role of social facilitation is especially important to consider in social situations because it highlights that peoples' behavior can be significantly affected by internal awareness of being watched or evaluated by others.

To close the loop of triadic reciprocal causation, Bandura (1986) proposed that, in everyday interactions, user behavior alters environmental conditions and, in turn, is changed by the same conditions that it creates. In addition, social cognitive theory highlights the need to explore aspects of social persuasion maintained by ambient environments. For that reason, the present study applies the Persuasive System Design model (Oinas-Kukkonen and Harjumaa, 2009) to identify the corresponding design principles (i.e., features of persuasive software) for social influence on user factors (i.e., self-regulation and observation) and user engagement in feedback sharing.

Social Influence Design Principles

Five social influence design principles—cooperation, competition, recognition, social learning, and social facilitation—were identified from the Persuasive System Design model (Oinas-Kukkonen and Harjumaa, 2009) based on their conformity to the previously described theoretical concepts.

The cooperation design principle can motivate users to adopt a target attitude or behavior by leveraging their natural impulse to cooperate, as described by Malone and Lepper (1987) and others (Bowles & Gintis, 2003; Okasha, 2013; Axelrod, 2000; Deutsch, 2011; Johnson & Johnson, 1989; Mead, 1937; May & Doob, 1937). The competition design principle can motivate users to adopt a target attitude or behavior by leveraging their natural drive to compete, as it is grounded in the judgment process of the self-regulation concept suggested by Bandura (1991), and described by Malone and Lepper (1987), and others (Deutsch, 2011; Johnson & Johnson, 1989; Rottiers, 2010; Mead, 1937; May & Doob, 1937). The judgment process explains how people make judgments about their own behaviors compared with traditional standards or the behaviors of others. In a way, these judgments drive human behavior towards competition with themselves or others. Public recognition of an individual provided by a system can increase the likelihood that the person will adopt a target behavior, as it is grounded in the self-response process of the self-regulation concept suggested by Bandura (1991), and described by Malone and Lepper (1987), and others (Rottiers, 2010; Hernandez et al., 2011; Sundaram et al., 1998). The self-response process explains how people reward themselves for their good behaviors. In this way, public recognition satisfies one's desire for rewarding self-responses and drives motivation towards a target behavior.

The social learning design principle indicates that users can be motivated to perform a target behavior if they use a system to observe others performing the behavior and learn from it. This design principle originates from the human capability of observational learning (Bandura, 1977) that has been previously studied in various contexts, including social networks (Lamberson, 2010).

The social facilitation design principle holds that users are more likely to perform a target behavior if they perceive through a system that others are performing the behavior along with them. This design principle originates from the social facilitation theory described by Zajonc (1965) and Guerin & Innes (2009). In summary, human behavior can be successfully altered by a system that harnesses social influence through specific design principles. This review identifies five social influence principles for enhancing user engagement within the setting of this study. Thus, the following hypotheses are formulated:

An information system consisting of cooperation (H1), competition (H2), recognition (H3), social learning (H4), and social facilitation (H5) design principles positively affects user engagement in feedback sharing.

In the next section, the identified social influence design principles are discussed in detail to investigate the potential interplay among them as well as their collective power to explain users' perceptions about the effectiveness of information systems designed to encourage user engagement in feedback sharing through situated displays that are integrated with social media. The research model for this study is also presented in the next section.

USER ENGAGEMENT IN FEEDBACK SHARING

The previous section identified five social influence design principles—cooperation, competition, recognition, social learning, and social facilitation—that have the persuasive powers to alter users' behaviors towards more active participation in feedback sharing, thus strengthening the effectiveness of such information systems.

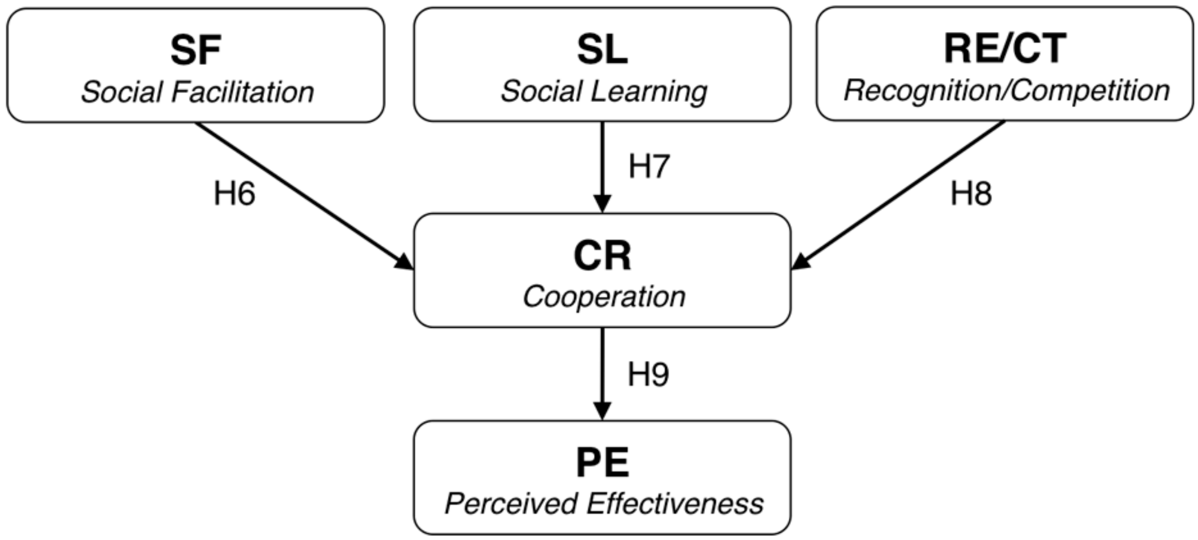
Businesses increasingly look to collect greater customer feedback, and the design principle of cooperation is helpful in fostering feedback because it motivates people to collaborate to achieve a shared goal (Malone & Lepper, 1987; May & Doob, 1937), which is to generate more feedback in this particular case. Therefore, cooperation stands in the very center of the research model depicted in Figure 2. The social facilitation design principle is helpful in promoting cooperation, as it indicates how many others are engaged at the same time (Gasser et al., 2006; Zajonc, 1965), thereby increasing peoples' motivation to generate more feedback along with others. Therefore, it is hypothesized that *social facilitation has a positive effect on cooperation (H6)*. The social learning design principle is helpful in advancing cooperation, as it provides a means for observing the behaviors of other people and learning from them (Bandura, 1977), which increases peoples' capabilities to generate more feedback. Therefore, it is hypothesized that *social learning has a positive effect on cooperation (H7)*. Finally, the competition and recognition design principles are helpful in supporting cooperation, as they provide means for observing one's own performance in comparison with that of others, which increases motivation to produce additional feedback, which is driven by a desire to achieve better results in competition or to receive more recognition (Rottiers, 2010). Therefore, it is hypothesized that *competition and recognition have a positive effect on cooperation (H8)*. These three hypotheses characterize the interplay of social influence design principles within the context of this study.

To examine the power of these design principles in explaining the effectiveness of information systems, the literature on technology acceptance advises measuring the main predictor of peoples' behavioral intention to use technology, namely its perceived usefulness (Venkatesh & Bala, 2008; Venkatesh et al., 2012). Originally, research on technology acceptance was developed in an organizational context, where employees were expected to use a new information system. However, this study focuses on users' voluntary engagement; thus, the concept of perceived usefulness is adapted as perceived effectiveness (Lehto & Oinas-Kukkonen, 2014), which is measured as users' perceptions about the effectiveness of information systems for altering user behavior towards engagement in feedback sharing. Therefore, it is hypothesized that *cooperation has a positive effect on perceived effectiveness* (H9). This completes the composition of the research model. To empirically test the research model, an information system is designed and implemented in the next section of this chapter.

Feedback Collection System

For the purposes of this study, an information system (hereinafter, the system) was developed with an aim to engage people in sharing feedback. The system was designed with the five previously identified social influence design principles at its core (hereinafter, features), adjusted for large displays, and integrated with Twitter. Compared to other social media, Twitter is convenient for a fast feedback-sharing process because it restricts the number of characters for each message to 140, thereby assisting users to describe their concerns in a efficient way (Boyd et al., 2010). This characteristic promotes Twitter as one of the most suitable social media for the engaging with the socio-technical systems previously described in this chapter because people typically spend a limited amount of time in particular public places such as airports or other public transportation hubs. Moreover, Twitter has been found to be effective for user engagement (Junco et al., 2011), persuasion (Young, 2010), and influencing actions outside the virtual world (Stibe et al., 2011).

Figure 2. Research model for this study



The system was designed to attract peoples' attention by projecting questions at the top of a display (Figure 3 and Figure 4), and people are able to provide feedback using Twitter, that is, by generating and sharing messages (tweets). As people start using the system, it automatically shows all updates on the display so that everyone can follow their own actions and also what others are tweeting.

Feedback provided by users is displayed in the form of a newsfeed in the middle of the display on the left side. This feature provides a means for social learning (Bandura, 1977), as it allows people to observe how others generate tweets and to continuously learn from that. At the bottom of the display, two social influence features are implemented: social facilitation (on the left side) and cooperation (on the right side). Displaying the number of active participants allows people to determine how many others are actually using the system along with them (Zajonc, 1965; Guerin & Innes, 2009), while displaying the goal of 100 tweets and the number of current tweets allows people to experience cooperation towards a common goal (Malone & Lepper, 1987). In the middle of the display on the right side, the system has either an implementation of the recognition feature (Figure 3) or the competition feature (Figure 4). They are purposefully separated in order to perform an elaborate study of their effects because they both originate from the same theoretical concept of self-regulation (Bandura, 1991), which is effective for influencing peoples' motivation by emphasizing their individual performances in comparison with others (Festinger, 1954). The recognition feature assigns special titles to active participants, which are then displayed together with their pictures and usernames. The competition feature displays the list of the most active users, arranged by the number of tweets they have each provided to the system.

Experiment

To empirically test the effects of the designed social influence features, 37 participants used the system simultaneously from two computer rooms. All participants in the study were international students of computer science in a graduate program in Finland and were enrolled in a course about information and communication technologies and behavior change. The participants were randomly divided

Figure 3. Display of the system with the recognition (RE) feature

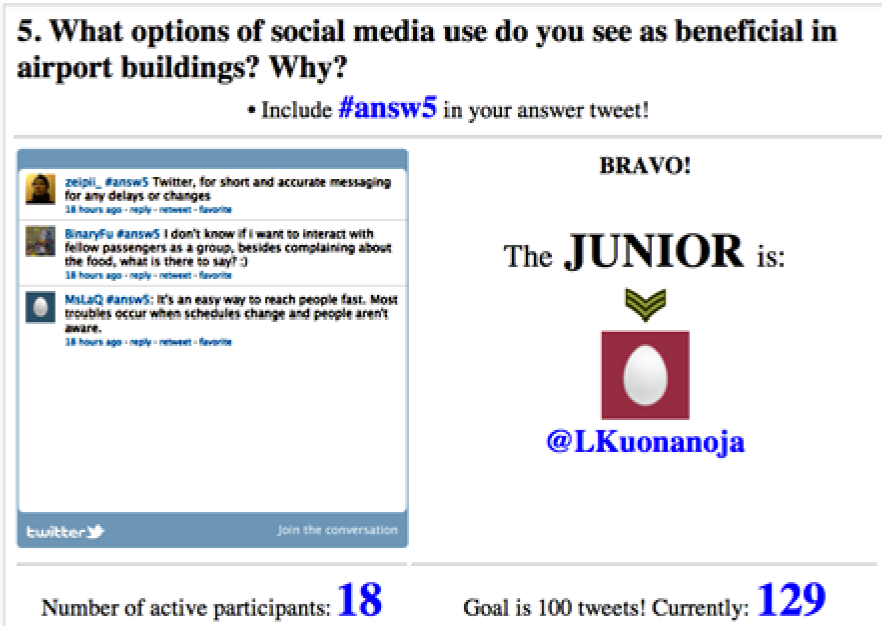
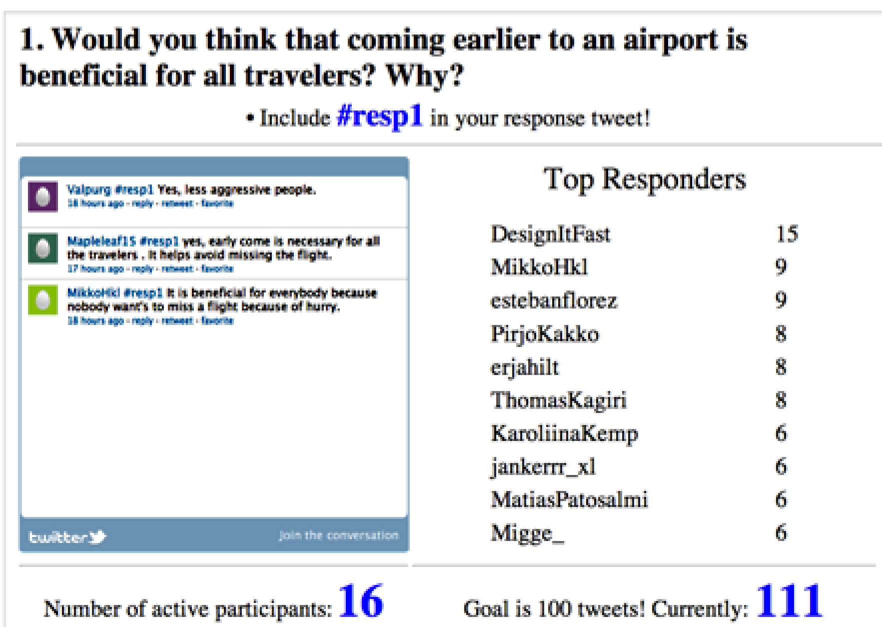


Figure 4. Display of the system with the competition (CE) feature



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 that emphasized the recognition feature (RE), and the other group, consisting of 19 people, interacted with the implementation that emphasized the competition feature (CT). To make it seem realistic, participants were asked to imagine that they were airline travelers waiting to depart at a gate in an airport setting. The system was projected on a big display in front of each group, and users generated their tweets from Twitter on desktop computers and mobile devices. The experiment lasted 30 minutes. Six questions related to airline travel issues were added to the system in pairs. At the beginning of the study, two questions rotated in a loop on the big display. 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. Right after the interaction with the system, all users were required to fill in an online questionnaire containing demographic questions and seven-point Likert-type scale indicators for assessing their attitudes towards the system (Appendix) and their Twitter experiences.

The respondents consisted of 24 males (64.9%) and 13 females (35.1%), mainly aged between 20 and 29 (86.5%), with positive attitudes towards Twitter as an influential tool (70.3%), but with less than six months of experience using Twitter (73%) and tweeting either sometimes or never (64.9%). Respondents all travel by air at least once a year on average (78.4%). A detailed summary is provided in Table 1.

ASSESSMENT OF THE SOCIAL INFLUENCE EFFECTS

Nearly all respondents (91.9%) agreed that the system was useful for feedback collection, and the majority of the respondents (83.8%) thought the system was effective for encouraging users to participate. The same number of respondents (83.8%) responded positively about the ability of the system to increase user participation in developing or improving services provided by airports or airline companies. In addition, 73.0% of the respondents believed that the system would work well at an airport, to some degree.

Tweets provided by others on the big display encouraged many users (78.4%) to come

Table 1. Respondents' characteristics

Demographics (N = 37)	Value	Frequency	Percentage (%)
Group	Recognition (RE)	18	48.6
	Competition (CT)	19	51.4
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
Length of Twitter use	Less than 6 months	27	73.0
	More than 6 months	10	27.0
Frequency of tweeting	Never or sometimes	24	64.9
	At least monthly	13	35.1

up with their own tweets, and even more users (81.1%) perceived the displayed number of how many others were tweeting at the same time as a positive motivator. Of the respondents, 70.3% perceived the goal of 100 tweets as a group task that required cooperation from all participants. The same number of respondents (70.3%) believed, to some degree, that Twitter is a powerful tool to call for action outside the virtual world. Furthermore, 73.0% of participants saw themselves in the list of top responders or recognized with special titles. A relatively smaller number of participants (67.6%) responded that the displayed list of top responders or public recognition positively motivated them to improve their performance.

Reliability and Validity

The research model was analyzed using partial least squares structural equation modeling (PLS-SEM) utilizing WarpPLS 4.0 software for data analysis. WarpPLS is a component-based path modeling software application that is appropriate to use when the purpose of the model is to predict, rather than to test, established theories (Hair et al., 2011). The statistical objective of PLS-SEM is similar to that of linear regression; that is, to demonstrate explained variance in the latent variable as indicated by R-squared values, to indicate the strength of the relationship between latent variables in terms of β values, and to test the significance of the relationship between latent variables by reporting their p-values (Gefen et al., 2011; Hair et al., 2011).

Overall, testing the model is carried out in two steps: assessment of the reliability and validity of the measurement model and assessment of the structural model. The measurement model includes the relationships between the constructs (Table 2) and the indicators (Appendix) used to measure them. The convergent and discriminant validity of the research instrument is examined in order to verify that the constructs' measures are valid and reliable before attempting to draw conclusions regarding relationships among constructs (i.e., the structural model).

The indicators of the measurement instrument employed in this study were derived from a number of sources to operationalize the constructs (Appendix). The scales for measuring social facilitation (Zajonc, 1965; Guerin & Innes, 2009), social learning (Bandura, 1977; 1986), cooperation (Malone & Lepper, 1987; May & Doob, 1937), competition (Malone & Lepper, 1987; Mead, 1937), and recognition (Malone & Lepper, 1987; Baumeister, 1998) are self-developed because there were no suitable existing scales for measuring these concepts. According to Boudreau et al. (2001), the use of previously validated instruments is efficient, but the fast pace of technological change often prevents researchers from investing time in novel instrument development. The scales for measuring perceived effectiveness are derived from Venkatesh et al. (2008; 2012) and Lehto and Oinas-Kukkonen (2014). Similar items for measuring the aforementioned constructs have been already tested (Stibe et al., 2013; Stibe and Oinas-Kukkonen, 2014a; 2014b). Prior to this study, the survey items were checked with another scholar from the same field of research to confirm that the scales demonstrate good face and expert validity.

Each construct of the research model was designed as reflective and was loaded with three indicators. The properties of the scales were assessed in terms of indicator loadings, discriminant validity, and internal consistency. Indicator loadings and internal consistencies greater than .70 are considered acceptable (Fornell & Larcker, 1981).

The constructs in the model demonstrate good internal consistency, evident from their composite reliability scores, which range between .83 and .89. Inspection of the latent variable correlations and square roots of the average variance extracted (AVE) in Table 2 demonstrate that all constructs share more variance with their own indicators as compared to other constructs. In addition, AVE values of all the constructs were well above the

Table 2. Latent variable correlations

	CRA	COR	AVE	SF	SL	RE/CT	CR	PE
SF	.78	.87	.69	**.83**				
SL	.71	.84	.63	.17	**.79**			
RE/CT	.82	.89	.73	.35	.09	**.86**		
CR	.69	.83	.62	.42	.38	.43	**.79**	
PE	.69	.83	.63	.17	.20	.33	.58	**.79**

CRA = Cronbach's Alpha; COR = Composite Reliability; Bolded diagonal = square root of Average Variance Extracted (AVE)

suggested minimum of .50 (Fornell & Larcker, 1981), thus demonstrating adequate internal consistency. As recognition and competition in this study were examined in separate groups, the reliability of the representative construct (RE/CT) was verified by inspecting them separately for each group. The Cronbach's Alpha levels of .82 for the recognition group and .80 for the competition group demonstrate that they do not significantly differ from .81 for the unifying construct (Table 2), so RE/CT was used for further analysis.

Because all variables were measured using the same instrument, common method variance posed a potential threat to the validity of the results. To test and possibly control for common method variance, Harman's single-factor test was conducted (Podsakoff et al., 2003). More than one factor emerged to explain the variance in our analysis, and the largest factor accounted for 31.3% of the variance, which implies that common method variance is unlikely to be a serious concern in the present study.

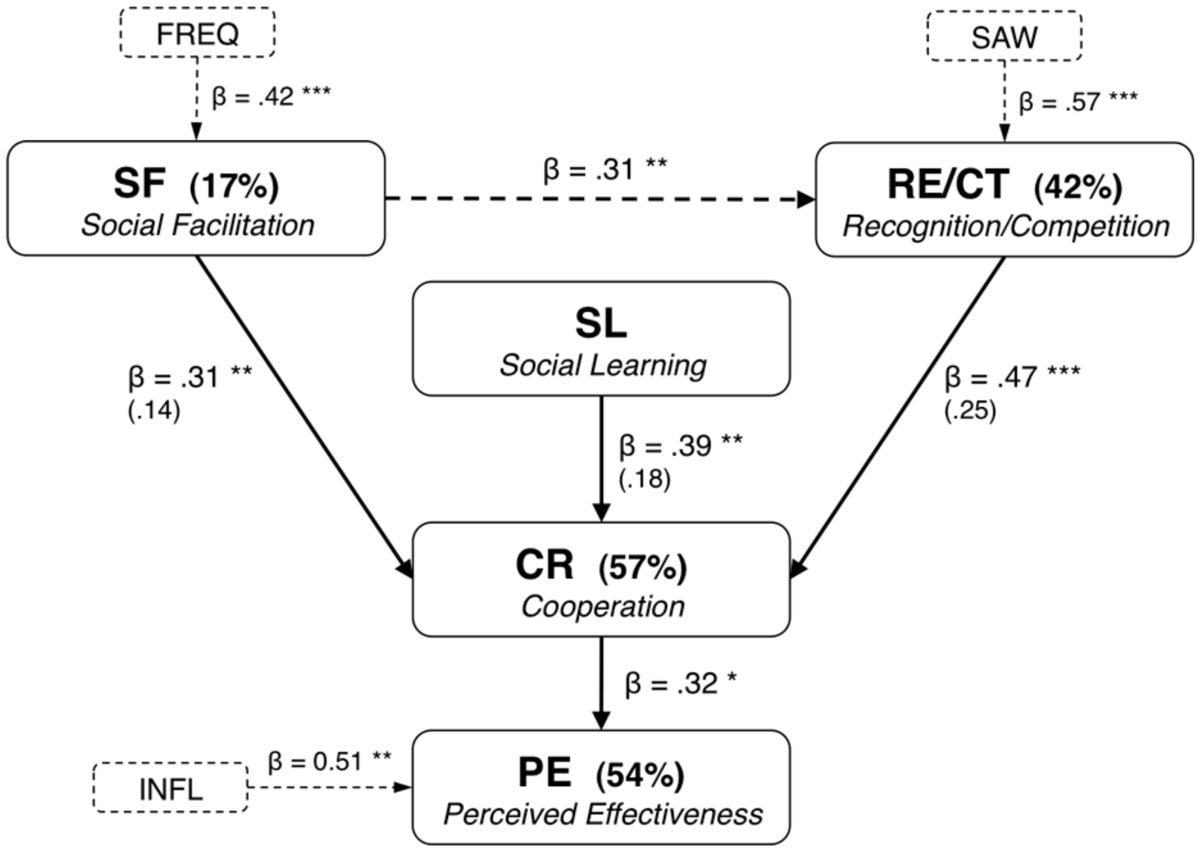
Collaborative Engagement

The results of the PLS-SEM analysis are presented in Figure 5. All hypotheses are supported and additional findings are presented with dashed lines in the structural model. The β values next to the arrows explain the strengths of the particular relationships, but the asterisks (*) mark their statistical significance. Effect sizes (f^2) determine whether the effects indicated by path coefficients are small (.02), medium (.15), or large (.35) (Cohen, 1988).

The results demonstrate that social facilitation, social learning, and RE/CT jointly explain 57% of variance in cooperation, which further explains 54% of variance in perceived effectiveness. Interestingly, an additional strong (.31), significant ($p < .01$), and medium (.14) effect of social facilitation on RE/CT was discovered.

After performing a more detailed analysis, three controlling effects were found relevant to the research model. First, a controlling effect of whether users found themselves being recognized or in competition (SAW) on their perceptions about both recognition and competition (RE/CT) features was found. This finding is significantly relevant, as SAW has a strong (.57), significant ($p < .001$), and large (.37) effect on users' perceptions about the features. The indicator "I saw myself recognized or in the list of top responders on the big display" and a seven-point Likert-type scale were used to measure SAW (Appendix). Second, a strong (.42), significant ($p < .001$), and medium (.17) controlling effect of frequency of tweeting behavior (FREQ) on social facilitation was found. To measure FREQ, the indicator "I tweet on average" and the answer options "never or sometimes," "monthly," "weekly," and "daily" were used. Third, a strong (.51), significant ($p < .01$), and large (.35) controlling effect of users' perceptions about Twitter being influential (INFL) on the perceived effectiveness of the system was found. The INFL factor was measured with the

Figure 5. Results of PLS-SEM analysis
**** p < .001; ** p < .01; * p < .05; (R-squared contributions)*



indicator "Twitter is a powerful tool to call for action outside the virtual world" and a seven-point Likert-type scale. More details about the total effects and their sizes are presented in Table 3.

Additionally, the results of the PLS-SEM analysis provide fit and quality indices that support the structural model (Kock, 2013). Besides reporting the values of average path coefficient (APC = .411, $p < .001$), average adjusted R-squared (AARS = .417, $p < .001$), and average block variance inflation factor (AVIF = 1.162), the model demonstrates a large explanatory power (GoF = .593) (Tenenhaus et al., 2005). Moreover, both Sympson's paradox ratio (SPR = 1.000) and the nonlinear bivariate causality direction ratio (NLBCDR = 1.000) provide evidence that the model is free from instances of Sympson's paradox (Pearl, 2009), and the direction of causality is supported.

The results from the PLS-SEM analysis demonstrate that all social influence features examined in this study played an important role in explaining the perceived effectiveness of the system. Moreover, the RE/CT construct is found to be the strongest predictor of user engagement in collaborative content generation, that is, in the actual feedback-sharing behavior. Therefore, more detailed analysis is presented in the next section to compare the recognition and competition features.

Table 3. Total effects and effect sizes

	SF	SL	RE/CT	CR	SAW	FREQ	INFL
SF						.42 *** (.17)	
RE/CT	.30 ** (.14)				.57 *** (.37)	.13 * (.14)	
CR	.45 *** (.21)	.39 ** (.18)	.47 *** (.25)		.27 ** (.11)	.19 ** (.00)	
PE	.15 * (.03)	.13 * (.03)	.15 * (.05)	.32 * (.19)	.09 * (.03)	.06 * (.03)	.51 ** (.35)

*** $p < .001$; ** $p < .01$; * $p < .05$; (f^2) = Cohen's f-squared

Recognition Outperforms Competition

The normality of distribution throughout the dataset was verified using the stem-and-leaf method provided by the Statistical Package for the Social Sciences (IBM SPSS version 19). 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 in SPSS. The statistical objective of a t-test is to indicate the significance of the difference in one factor or dimension between means of two independent groups by estimating t-values and reporting their corresponding p-values.

When comparing both groups (Table 4), the results demonstrate that the users of the system with the recognition feature (RE) had stronger beliefs about its effectiveness for user engagement (PE) and its success in a real airport context (PE). The RE group was also more willing to generate more feedback when the total number of tweets got closer to the goal of 100 tweets (CR).

Additional elaborate comparison (Table 5) of users from the recognition group (RE) who saw themselves (SAW) being recognized on a big display (72%, n = 13) against other users (28%, n = 5) revealed that the first subgroup maintained stronger beliefs about the success of the system in a real airport context (PE), and they were more willing to produce more feedback when the total number of tweets got closer to the goal of 100 tweets (CR). In contrast, more elaborate comparison of users from the competition group (CT) who saw themselves (SAW) among top responders on the big display (74%, n = 14) against other users (26%, n = 5) revealed no significant differences in any of the aforementioned dimensions.

The findings described in this section provide support for the increased persuasive capacity of cooperation (CR) when combined with recognition (RE) rather than competition (CT) in such settings. To uncover the effects of users' previous Twitter experience on their beliefs about the system, the next section of this chapter presents additional results of the t-test analysis.

Previous Twitter Experience

The additional t-test analysis revealed several findings about the effect of Twitter experience in other dimensions of the present study. The comparison of the responses by users who had been using Twitter for less than six months against those with longer-term experience revealed three significant differences (Table 6).

Users with less Twitter experience responded more positively that the content tweeted by others inspired them to create their own responses. This finding explicitly conveys the basic idea of social learning (SL), and it appears to be more salient for

Table 4. T-test results: Recognition vs. competition

	RE	CT	t-value	df	p
I believe that the system would work well in a real airport. (PE3)	5.56	4.32	2.937	35	.009 **
I felt more willing to post additional tweets as the total number of tweets got closer to the goal of 100. (CR3)	5.17	3.84	2.680	35	.011 *
I think that the system is effective for encouraging users to participate. (PE2)	6.11	5.11	2.570	35	.015 *

RE = recognition group; CT = competition group; df = degrees of freedom; ** $p < .01$; * $p < .05$

Table 5. T-test results: Saw themselves recognized vs. others

I saw myself recognized on the big display. (SAW)	Yes	No	t-value	df	p
I felt more willing to post additional tweets as the total number of tweets got closer to the goal of 100. (CR3)	5.77	3.60	3.401	16	.004 **
I believe that the system would work well in a real airport. (PE3)	5.85	4.80	2.927	16	.010 *

Yes = saw themselves; No = others; df = degrees of freedom; ** $p < .01$; * $p < .05$

users with less Twitter experience. Experienced Twitter users were more inclined to agree that, on average, they tend to tweet more often (FREQ) than less experienced Twitter users.

When comparing users that tweet at least monthly on average against those who tweet less frequently, the results revealed four significant differences between the groups (Table 7). Users who tweet more often on average were significantly more positive about Twitter being influential in calling for action outside the virtual world (INFL); they had believed more strongly that the dynamic flow of tweets on the big display made them feel like posting more tweets and that the display of growing numbers of active participants encouraged them to be more active in tweeting. The last two findings demonstrate significant effects of social facilitation (SF) on frequent tweeters. Users also reported significantly greater positive responses about willingness to post additional tweets when the total number of tweets got closer to the goal of 100 tweets, which implies the principle of cooperation (CR).

The comparison of users (Table 8) who agreed that Twitter is an influential tool (INFL) to call for action outside the virtual world (70.3%, n = 26) against other users (29.7%, n = 11) reveals that the first subgroup had stronger beliefs about the success of the system in a real airport (PE), and this subgroup was more willing to produce more feedback when the total number of tweets got closer to the goal of 100 tweets (CR).

In summary, the results of this section demonstrate that users' previous Twitter experience and their opinions about this medium could influence their beliefs about the designed system and

Table 6. T-test results: Length of Twitter use

Length of Twitter use.	< 6 m	> 6 m	t-value	df	p
I tweet at least monthly on average. (FREQ)	1.30	2.00	-2.845	35	.007 **
The content tweeted by others encouraged me to create my own responses. (SL2)	4.78	3.20	2.747	35	.009 **

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

Table 7. T-test results: Frequency of tweeting

Frequency of tweeting. (FREQ)	ALM	NOS	t-value	df	p
Twitter is a powerful tool to call for action outside the virtual world. (INFL)	5.85	4.38	4.228	35	.000 ***
The dynamic flow of tweets on the big display made me feel like posting more tweets. (SF3)	5.62	4.08	4.029	33	.000 ***
The displayed growing number of other active participants encouraged me to be more active in tweeting. (SF1)	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. (CR3)	5.31	4.04	2.406	35	.022 *

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

the implemented social influence features. This means that previous experience using a particular social medium could play a significant role in determining peoples' attitudes and behaviors towards using socio-technical systems such as the one presented in this study. Therefore, the experience of potential users should be carefully considered when deciding which social media to integrate for a particular context.

DISCUSSION

The results of this study provide evidence regarding the various positive effects of social influence design principles on user behavior targeted to feedback sharing. Almost all users considered the system useful for collecting feedback. A majority of participants agreed that the system could effectively encourage users to participate and could engage users 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. This finding implies the idea of learning from observing others performing the target behavior, thereby conveying the main idea of the theoretical concept of vicarious learning from the social learning theory (Bandura, 1977) and providing support for hypothesis H4. Further, even more users perceived the displayed number indicating how many others were tweeting at the same time as a positive motivator. This finding reflects the theoretical concept of social facilitation (Zajonc, 1965; Guerin & Innes, 2009), thus providing support for hypothesis H5.

Almost three-quarters of the respondents saw 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). The judgment process supports the competition feature, implemented here as the list of the top responders, and the self-response process sup-

Table 8. T-test results: Influential vs. others

Twitter is a powerful tool to call for action. (INFL)	Yes	No	t-value	df	p
I felt more willing to post additional tweets as the total number of tweets got closer to the goal of 100. (CR3)	5.00	3.27	3.344	35	.002 **
I believe that the system would work well in a real airport. (PE2)	5.35	4.18	2.721	35	.010 *

Yes = influential; No = others; df = degrees of freedom; ** $p < .01$; * $p < .05$

ports the recognition feature (Oinas-Kukkonen & 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), thus providing support for hypothesis H1.

The results from a rigorous PLS-SEM analysis provide support for all hypotheses in the research model. They demonstrate that competition, recognition, social learning, and social facilitation all have strong, significant, and medium effects on cooperation, and together they explain more than half of the variance in it. These results provide support for hypotheses H6, H7, and H8. Further, cooperation has very strong, significant, and large effect on perceived effectiveness, and explains more than one third of the variance in it. This result provides support for the final hypothesis, H9. Additionally, an effect of social facilitation on the recognition/competition construct was discovered. This implies that the presence of other users not only has a direct effect on cooperation, but also has an indirect effect on it through recognition and competition. Thus, the more users were able to perceive other participants along with them, the more they perceived a sense of recognition and competition.

In addition, three interesting controlling effects were found during this data analysis. First, recognition and competition had a stronger influence on those users who had seen themselves individually recognized or listed among the top responders. Compared to other features of this study, only these two were designed to indicate users' behaviors based on their individual results, which enabled users to compare their performances. According to the social comparison theory, people tend to compare their behaviors with others to seek inspiration when they are performing poorly or to gratify themselves when they are doing well (Festinger, 1954). This provides a potential explanation for why both of these features had stronger effects on those users who discerned themselves through them compared to those who did not. Second, social facilitation had a stronger influence on users who tweet more frequently on average. Presumably, frequent tweeters are more aware of how to discern others and their activities on Twitter (Honey & Herring, 2009); thus, they are more equipped to experience this through a system with a similar design. Third, users who thought that Twitter is influential to call for action outside the virtual world had stronger beliefs that the system is effective for user engagement in feedback sharing.

Additional findings reveal that recognition outperforms competition in influencing users' willingness to generate more feedback and in influencing their beliefs about the effectiveness of the system. This pattern appears to be even more salient for those users who saw themselves recognized through the system. In addition, previous Twitter experience plays a substantial role in predicting users' perceptions about social influence features. Cooperation is more salient for users who perceive Twitter as an influential tool, and, together with social facilitation, is more salient for frequent tweeters. As anticipated, social learning had stronger effects on users with less Twitter experience. Finally, users who perceive Twitter as an influential tool believed more strongly that the system would work well in a real airport.

To extend this discussion, potential future research directions and implications for practitioners are highlighted in the next section of this chapter.

FUTURE RESEARCH DIRECTIONS

The main findings of this chapter provide implications for both further research related to social influence on user behavior and for practitioners designing current persuasive systems.

Research Implications

Further research should focus on broadening the research framework, extending the research model with other social influence design principles, and refining the design of the examined persuasive software features. However, particular future studies could be focused not only on testing expanded versions of the current research model, but they could also break it down and test each social influence design principle separately or in various combinations. Such studies would contribute to the development of a more elaborate understanding of different social influence design principles and their effects on user behavior when implemented as persuasive software features. Another direction for further research would be to study the design of particular social influence features. The number of different implementations for the same feature is limitless. Thus, further research in this direction would reveal new design patterns that have increased power to shape user behavior. These designs can then be tested in the same or in different contexts to find their best fit.

Managerial Implications

Practitioners can already design their own systems based on the artifacts provided in this chapter, or they can develop new approaches, for example by redesigning some of the social influence features. Businesses can easily utilize the existing infrastructure, that is, public screens, to establish such systems on their premises and collect feedback from their customers immediately. Further, organizations could launch such systems within their work environment to facilitate internal discussions. For example, a screen in a coffee room could potentially engage employees in sharing feedback about concerns and ideas related to their work. Any implementation of such systems in actual places provides another opportunity for researchers to test various designs of social influence features, thereby complementing the existent body of knowledge.

In the future, when countless screens are increasingly appearing in public places, for example, in supermarkets, movie theaters, museums, government offices, hospitals, schools, restaurants, transportation spots, and even vehicles, such socio-technical systems could gradually become an integral part of these environments, thus becoming a seamless and natural channel for businesses to engage with their customers wherever they currently are. These channels could play a significant role in advancing customer relationships on the one hand, and in increasing the amount of relevant feedback for organizations on the other, because they enable immediate interaction in the place where customers acquire new experiences about a certain service or product.

CONCLUSION

Studies such as the one presented in this chapter are highly relevant, as they advance the design of future information systems (Loock et al., 2011). Along these lines, this chapter provides both researchers and practitioners with richer insights on how social influence principles can be designed as persuasive software features for information systems aimed at facilitating behavior change among users. Drawing upon the social cognitive theory (Bandura, 1986), the social learning theory (Bandura, 1977), the taxonomy of intrinsic motivations for learning (Malone and Lepper, 1987), the social facilitation theory (Zajonc, 1965), and interconnecting these theories through the Persuasive Systems Design model (Oinas-Kukkonen and Harjumaa, 2009), this chapter has explored the effects of social influence design principles on altering user behavior towards engagement in feedback sharing through social media integrated with situated displays. A theory-driven research framework was developed based on the relevant literature and a specific research model was proposed for further examination.

Five social influence design principles—cooperation, competition, recognition, social learning, and social facilitation—were indicated in the research framework and then were designed as persuasive software features in an information system. This system was integrated with Twitter, adjusted to large displays, and used by 37 participants. The perceptions of participants about the system were measured using an online survey instrument, and then were analyzed with two quantitative data analysis methods. The research model was primarily tested using the partial least squares structural equation modeling technique, followed by more detailed analysis using the independent samples t-tests. The results of the primary analysis provided substantial support for the research model, and the subsequent t-tests enriched the understanding of particularities associated with the uncovered effects of social influence features on users' perceptions about the system.

The limitations of the study include the experimental setting based on a hypothetical scenario, where users were able to watch others performing the feedback-sharing behavior, and the narrow sample of participants in terms of age and education. These limitations hold potential threats to the validity and generalizability of the results of this study. However, the developed research framework, the proposed model, the reviewed theoretical concepts, and the design of particular social influence features could be applicable to other settings and contexts.

Overall, this study provides valuable input for further research related to social influence on user behavior and it highlights several useful elements for the designers of persuasive information systems. At the same time, businesses can gain immediate benefits by designing and launching such systems on their premises and collecting feedback from their customers.

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KEY TERMS AND DEFINITIONS

Competition (CT): The process of endeavoring to gain what others are endeavoring to gain at the same time. For example, users could experience competition if they are able to see themselves in the list of top users of the same system, which are ordered based on their performance.

Cooperation (CR): The process of striving to achieve the same goals or working together. For example, users could see the results of their cooperative efforts through the same system.

Feedback Sharing: The process of generating and providing relevant information about one's experiences related to a product, service, or brand. It is important for companies to collect customers' feedback in order to be able to improve their offering so it will better match the needs of their customers.

Persuasive Technology: Technology that is intentionally designed to influence behaviors or attitudes. Typically, such technologies are developed to target a specific behavior with an aim to change it.

Recognition (RE): The value that one derives from gaining acceptance and approval from others. For example, users could receive public recognition in the form of special titles that are assigned to them for their behaviors and displayed through the same system.

Social Facilitation (SF): The influence on one's behavior when surrounded or watched by others. For example, users could perceive others using the same system along with them.

Social Influence: The influence on one's behavior by the actual, imagined, or implied presence of others. People experience immediate influences from others as soon as they occur in a social environment.

Social Learning (SL): The process of acquiring new knowledge through observing the behaviors of other people. For example, users could observe others through the same system and learn from them.

Twitter: The popular online micro-blogging service for posting messages limited to 140 characters. Twitter was established in March 2006 and it currently attracts more than 241 million monthly active users (https://about.twitter.com/company).

User Engagement: The user experience that combines psychological involvement and practical participation in a target behavior. For example, users can experience engagement in feedback sharing if they actually do it and they believe that such behavior is valuable, at the same time.

APPENDIX

Table 9. Measurement items and combined loadings

Construct		Indicator	Load
Social Facilitation (Zajonc, 1965; Guerin & Innes, 2009)	SF1	The displayed growing number of other active participants encouraged me to be more active in tweeting.	.86
	SF2	I perceived the displayed number of active participants as a positive motivator that showed me how many others were tweeting at the same time.	.79
	SF3	The dynamic flow of tweets on the big display made me feel like posting more tweets.	.84
Social Learning (Bandura, 1977; 1986)	SL1	Tweets provided by others on the big display encouraged me to come up with my own tweets.	.78
	SL2	The content tweeted by others encouraged me to create my own responses.	.85
	SL3	From the tweets of others, I learned how to tweet myself.	.75
Recognition/ Competition (Malone & Lepper, 1987; Mead, 1937)	RE/CT1	The displayed [public recognition/list of top responders] motivated me to produce more tweets.	.83
	RE/CT2	The displayed [public recognition/list of top responders] helped me to monitor my performance.	.88
	RE/CT3	The displayed [public recognition/list of top responders] motivated me to improve my performance.	.85
Cooperation (Malone & Lepper, 1987; May & Doob, 1937)	CR1	The displayed goal of 100 tweets and the adjacent counter stimulated me to produce more tweets.	.86
	CR2	I perceived the goal of 100 tweets as a group task that requires cooperation from all participants including me.	.67
	CR3	I felt more willing to post additional tweets as the total number of tweets got closer to the goal of 100.	.82
Perceived Effectiveness (Venkatesh et al., 2003; 2012)	PE1	I think that the system is effective for encouraging users to participate.	.65
	PE2	I believe that the system would work well in a real airport.	.89
	PE3	I would expect the system to increase user participation in the development or improvement of services when provided by airports or airline companies.	.81

All indicators employed a seven-point Likert-type scale for assessing attitudes, with the following response options: 1) strongly disagree, 2) disagree, 3) disagree somewhat, 4) undecided, 5) agree somewhat, 6) agree, 7) strongly agree.