New Media Use in Context

Environmental Cues and Online Self-Disclosure via Weblogs

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Abstract—As Internet access moves away from desktop platforms to increasingly mobile, handheld, ubiquitous computing tools, questions arise regarding the impact physical surroundings have on online self-disclosure. Considering that popular Web2.0 applications like weblogs are characterized by broad and often intimate disclosures of personal information, we test the relationship between a range of environmental characteristics and onine self-disclosure via blogs. Results suggest that both the familiarity and perceived warmth of locations predict online disclosure. Interestingly, results also suggest that people with low general life satisfaction who also like to talk about themselves tend to engage in online self-disclosure.

Keywords- Web2.0, weblogs, online self-disclosure, physical context, social context.

I. INTRODUCTION

Today it is possible for people to be constantly connected to one another via portable computing devices such as laptops and cell phones. Internet users' shift from content consumers to content producers is one of the most dramatic changes in the media landscape in the past 50 years. Web2.0 refers to the social web and the changing role of Internet users [1]. This term highlights the increasing prevalence of personal, user-focused content online. Over half of all Internet-using teens are "content creators" who publish websites or blogs, share original media like photos and videos, or remix content into new creations [2]. Social networking sites like MySpace (http://myspace.com) and Facebook (http://facebook.com) are becoming cornerstones of this informational space, with many recent surveys finding that 95% or more of college students maintain site profiles (e.g., PACS survey, 2007). The growth of user-generated content parallels another critical technological shift: the development and adoption of mobile, ubiquitous computing devices (ubicomp).

According to a 2007 PEW survey, 62% of all Americans have had some experience with mobile access to digital tools like cell phones or PDAs. These data reflect technology use from a location other than the home or workplace, further illustrating the great reach of ubicomp [3]. In fact, 21% of respondents said they accessed the Internet away from home or their workplace at least a few days per week. Today's online behavior manifests in a myriad of venues, and while this interaction may feel impermanent and ethereal, in reality users are contributing to an expansive and growing database of personal information. Some of the most popular Internet-based applications (e.g., facebook.com) facilitate and encourage the disclosure of personal information by supporting interpersonal communication (for a review of online self disclosure, see Stefanone and Jang [4]).

Blogs are a particularly popular medium for the non-directed self-disclosure of personal information. Online self-disclosure (OSD) via blogs is conceptualized as non-directed because bloggers target a group of readers, opposed to traditional self-disclosure where a sender targets a specific other for communication. According to a 2006 survey, roughly 12 million people, 8% of American Internet users, post their thoughts to personal blogs and 39% of Internet users reported reading blogs [2]. The entries to these blogs are similar to writing in a journal or diary since the most popular type of entry was about their "life and experiences" [2]. The key difference is that while a diary might be kept private, blog posts tend to be publicly accessible.

Ryan defines traditional rules that govern how people disseminate information as notification norms [5]. However, when considering the relationship between ubicomp and OSD via blogs, some novel scenarios emerge. First, the decision to disclose personal information via blogs could potentially be shaped by the comfort and privacy of users' physical environment. This is becoming an increasingly important consideration as Internet access moves away from desktop computing platforms to mobile, handheld devices. In addition to the dynamic physical context of technology use, disclosure decisions may also hinge on user's social contexts and psychological states. What follows is a review of literature on social exchange and self-disclosure. Then, a review of one popular Web2.0 tool, the personal weblog (blog) is presented. This is followed by a discussion summarizing research on the relationship between physical space and behavior that is the foundation for the hypotheses presented in this manuscript. We propose that there is a relationship between where people decide to engage in OSD and the content of that self-disclosure.

II. SOCIAL EXCHANGE ONLINE

Social exchange theory suggests that humans will gradually increase the breadth and depth of information they share with each other during interpersonal communication [6]. Further, the intimacy levels of self-disclosure tend to be reciprocal [7].

Reciprocal exchanges are viewed as pleasing [8] and lead to higher levels of trust over time [9]. The tendency to self-disclose feeds additional disclosures from others through a reciprocity effect. This process of mutual and reciprocal self-disclosure is the mechanism through which relationships develop and grow in intimacy.

An important set of elements which likely affect social exchange are the *environmental characteristics of the space* in which the exchange occurs. As ubicomp grows in popularity, people become more likely to maintain relationships and disclose information via the Internet from a range of physical locations. Whereas interpersonal communication was once limited to face-to-face interaction, today's online conversations are unimpeded by space and time.

A. Blogs

The most common form of blogs are personal journals or diaries [10]. Blogs are notably different from traditional personal journals because they tend to be publicly accessible. This accessibility has facilitated the use of blogging as a tool for maintaining existing offline relationships. For example, research by Stefanone and Jang found a positive relationship between social support network size and the likelihood to use blogs as a tool to help maintain those existing relationships [4]. Here, blogs reduce the costs associated with maintaining large, geographically disparate strong tie networks.

However, the traditional process of social exchange is influenced by affordances associated with blogs. Consider that the format of blogs is functionally unique because they facilitate broadcast transmissions of personal information to networks of densely connected friends *and* family as well as to unknown audiences [4]. This unique characteristic of non-directed self-disclosure leads to critical differences compared to traditional interpersonal exchange. For example, non-directed self-disclosure lacks the personal focus of directed messages. This is related to non-personalistic self-disclosure in which information is revealed to multiple targets and the effect of creating the perception of exclusivity is mitigated [11, 12].

Although the size of people's social support networks influences technology use and the likelihood of OSD, the physical environment may also play a role and influence self-disclosure via blogs. The following review summarizes research on the relationship between people's behavior and stimuli situated in physical environments.

B. Environment and Behavior

The current research operationalizes the physical environment as a combination of characteristics associated with *spaces* and *places*. First, we operationalize space in terms of the presence or absence of a range of elements in specific physical locations. For example, one can quantify whether couches, a television, or windows and rugs are present in a room (in this case, a family room). Alternately, we operationalize places as recognizable locations that provide people with clear and consistent cues regarding appropriate behavior. For example, well known scripts for behavior are associated with getting tables at restaurants and interacting with the wait staff. Here, places provide general and normative cues to guide behavior while spaces are characterized by the presence or absence of interior design artifacts.

Early research by Maslow and Mintz explored the idea of space by studying the relationship between the comfort of furniture, varying wall and table decorations and lighting intensity, and people's perceptions [13]. Photographs of "beautiful" rooms were rated significantly higher in terms of "energy" and "well-being," indicating the capacity for physical spaces to affect perception.

Miwa and Hanyu also suggest that interior design elements like furniture and art affect subjects' feelings and behavior [14]. They staged counseling sessions and manipulated lighting and décor elements. Those in dimly-lit rooms reported higher levels of pleasant feelings and gave more favorable evaluations of the interviewer. They also reported higher levels of self-disclosure. These results suggest that physical spaces not only affect perceptions [13], but interior design elements also affect behavior. Bitner [9] demonstrated that additional factors such as noise level, temperature and brightness may also influence perceptions, and others suggest that characteristics of public spaces affect behavior as well [151, 16]. These findings suggest a systematic relationship between environment and behavior. Thus, evaluating the environment is important when discussing OSD. When people post to their blogs, the composition of that space may affect the breadth and depth of OSD. Rooms with soft and 'warm' design elements should promote OSD. Therefore, we propose

H1: Environmental comfort has a positive relationship with the level of OSD.
   H1A: There is a positive relationship between the presence of soft and comfortable interior elements and the amount of OSD via blogs.
   H1B: There is a positive relationship between perceived warmth of spaces and OSD.

The perceived comfort and warmth of spaces increases over time, as well. When people move to start university studies or a new job, those transitions are associated with a high level of uncertainty. Not only are there a range of logistical issues like navigating the new location, there may also be social ambiguity as one works to initiate and manage new relationships. Further, it takes time to make places 'your own' through the addition of personally desirable interior design elements to spaces. Thus as spaces become more familiar, OSD is likely to increase. Thus,

   H1C: There is a positive relationship between the length of time bloggers have lived in one location and OSD.

Although the psychological characteristics of spaces may influence online behavior, physical isolation may contribute to perceptions of privacy and also influence online behavior. Sundstrom, Burt and Kamp discuss architectural privacy and how it affects psychological privacy and job satisfaction [17]. They describe architectural privacy as the design

characteristics of spaces which afford varying levels of visual and acoustic isolation. Little, Briggs, and Conventry suggest that privacy considerations are prerequisite to the design of public spaces [18]. Further, Yildirima, Akalin-Baskayab and Celebia found that office workers prefer higher partitions than lower ones [19]. Conversely, crowding — the result of low architectural privacy and high co-worker interaction — can impede perceptions of privacy and result in more distractions and lower job satisfaction [17]. Together, this evidence suggests a relationship between perceived privacy and online behavior particularly when that online behavior involves disclosing personal information on blogs. Thus,

H1D: There is a positive relationship between perceptions of privacy and OSD.

The relationships hypothesized so far may be moderated by people's sensitivity to their environment. Bloggers' overall sensitivity to their environment may interact with the design elements in spaces functioning to heighten OSD. Thus,

H2: Environmental sensitivity will interact with environmental characteristics such that
H2A: The interaction between environmental sensitivity and the number of "comfortable" interior elements is associated with heightened OSD.
H2B: The interaction between environmental sensitivity and familiarity is associated with heightened OSD.
H2C: The interaction between environmental sensitivity and perceived warmth is associated with heightened OSD.
H2D: The combination of environmental sensitivity and perceived privacy will result in heightened OSD.

The research outlined above suggests that users will alter online behavior based on their perceptions of the physical environment. Additionally, people are conscious of their surroundings to various degrees. Given the evidence that environment impacts behavior, it stands to reason that people who are more sensitive to their environment will be impacted to a greater degree. However, a growing body of literature suggests an alternative environmental explanation: users' social context of technology use may be a significant predictor of online behavior.

C. Social Motivations for Disclosure

While the evidence outlined above suggests that physical context influences self-disclosure, people's social context influences technology use as well. For example, the vast majority of Internet users reported using the Internet to communicate with friends and family 20]. Research by Hampton and Wellman [21] found that the Internet functions to support and strengthen social ties, and Franzen [22] found that email in particular facilitates relationship maintenance. This evidence suggests that CMC creates additional opportunities for relationship maintenance and support beyond those afforded by phones and face-to-face visits. Consistent with Herring et al. 10], the reconfiguration of websites into

interactive blogs may be symptomatic of the recurring trend to adopt technology for interpersonal communication.

The most frequently measured aspect of relationships is tie strength, or intensity, an indication of how close a respondent reports being to each network member [23]. Strong tie contacts are characterized by frequent, reciprocal communication and usually a long, stable history of interaction. Often, strong ties constitute relationships with family and close friends. In contrast, weak ties are characterized by infrequent communication, low reciprocity, and a lack of emotional closeness [24]. In economic terms, strong tie relationships are more costly to maintain given their richness and intensity. As the frequency of these relationships increases, so does the motivation to use cost-reducing technologies like blogs to communicate with close friends and family [4]. Consequently, bloggers with larger strong tie networks should be motivated to blog more frequently and exhibit a higher degree of self-disclosure. We therefore propose the following alternative hypothesis for OSD:

H3: There is a positive relationship between strong-tie network size and OSD.

McPhearson, Smith-Lovin and Brashears demonstrated that, on average, the number of people we can define as confidants is shrinking [25]. While people in 1985 had roughly three people to turn to for emotional aid, that number decreased to roughly two people in 2004. As the number of individuals to whom we can turn for support declines, concern for existing ties may be heightened. As a consequence, behaviors associated with maintaining ties, such as disclosure, may also increase. Thus,

H3A: There is a positive relationship between concern for strong ties and online SD.

In addition to disclosing for the purpose of informing others and maintaining relationships, some people may exhibit traits which make them more prone to disclosing information in social contexts. Research by Ksionzky and Mehrabian has indicated that individuals with lower sensitivity to rejection are more likely to disclose [26]. Likewise, Reno and Kenny suggest that individuals who are less privately self-conscious are more likely to disclose [27]. These findings suggest that the more confident and self-assured an individual is, the more likely they are to disclose. We characterize this self-assuredness as *egocentrism*. Thus,

H3B: There is a positive relationship between egocentricity and OSD.

Although each of the hypotheses listed above has theoretical backing, social awareness may serve to moderate OSD much like environmental awareness likely moderates perceptions of warmth, comfort and privacy. People may respond differently to measurements of their life satisfaction, concern for their strong ties and egocentrism based on their

sensitivity to social factors. An individual who is not particularly attuned to their social environment, for example, may not perceive themselves as being particularly egocentric, even if they happen to be. We therefore suggest that a blogger's overall sensitivity to their social environment may interact with their social context, and influence overall disclosure. Thus,

H4: Social sensitivity will interact with the social involvement variables in predicting online self disclosure.

H4A: Social sensitivity will interact with STN network size, resulting in heightened OSD.

H4B: The combination of social sensitivity and concern for close ties will result in heightened OSD.

H4C: Social sensitivity will interact with egocentrism resulting in heightened OSD.

The proposed hypotheses are represented in figure 1, below. Both the perception of the physical space (perceived warmth and environmental sensitivity) and the perception of the social space (egocentrism and life satisfaction) are linked to OSD via blogs. Each of those, in turn, is influenced by a more concrete variable—the number of comfortable objects in the case of the physical and strong tie network size in the case of the social.

Figure 1. A Graphical Representation of the Factors Contributing to Online Self-Disclosure.
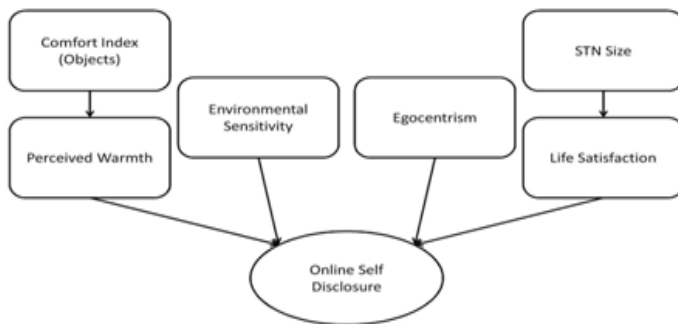
III. METHODS

To address these research questions and hypotheses, the authors conducted an online survey of a sample of bloggers. The sample was produced by first examining several major blog hosting service sites, including blogger.com and livejournal.com. At the time of this study, only blogger.com offered a working random blog selection feature. Using the random blog pointer on blogger.com, a list of 5800 unique blogs was generated. The target sample consisted of adults who wrote personal-journal style blogs. As a result, blogs created for commercial or organizational purposes (i.e., marketing particular products or office coordination services) and blogs containing pictures only were excluded. In addition, to ensure that only active bloggers were invited blogs with less than three posts on two different dates in the three-month period prior to the sampling were excluded, as were multi-author blogs. Because this study was interested in the effects

of target audience, these restrictions were implemented to ensure participants were solely responsible for the audience drawn to their blogs. Finally, blogs with authors younger than 18 years old were eliminated.

672 blogs met these criteria and were invited to participate. Some bloggers who met our criteria were not invited because they did not provide an email address or allow comments to be posted to their blog. A total of 173 people responded to the survey invitation, yielding a response rate of about 26 percent. The average age of subjects in our sample was 32.4 years of age ($SD = 9.9$). Approximately 62% of participants were female.

The majority of participants identified their ethnic background as Caucasian (71.7%). Approximately 17% were Asian/Pacific, 5% were Hispanic, and about 6 percent reported a variety of other ethnicities. Roughly two-thirds lived in the United States, about 24% lived in Europe and Asia, and the rest (about 7%) came from a variety of other regions. Additionally, respondents reported an average strong tie network size of 6.3 ($SD = 4.0$).

A. Environmental Measures

Recall that physical context is differentiated between *spaces* that contain artifacts like interior design elements and *places* that are associated with distinct norms which guide behavior. In order to assess the role environmental factors play in blog self-disclosure, we adapted survey items from Maslow and Mintz which measured specific design elements of their blogging "space" including the type of flooring, lighting, wall decorations, cushioning and personal wall decorations [13]. An overall environment score was calculated for each subject and ranged from 6 (many comfortable elements) to a minimum possible score of -6 (many uncomfortable elements, $M = 1.52$, $SD = 2.2$). Because the characteristics of spaces may not be fully captured by the above items, we included one additional item. Participants were asked to indicate (1 = cold, 7 = warm) how warm the space where they posted to their blog was ($M = 5.36$; $SD = 1.19$). Respondents were also asked to rate the level of privacy their blogging environment afforded them. Respondents answered this question with a single item ranging from 1 (no privacy) to 7 (total privacy) ($M = 4.57$, $SD = 1.9$).

Environmental sensitivity was measured using 6 items (e.g., I am conscious of what is going on around me; I am keenly aware of everything in my environment; Cronbach's $\alpha = .76$). On average, participants reported a mean score of 5.57 ($SD = .87$).

B. Self- Disclosure Measures

Egocentricity was measured with three items: "I usually talk about myself for fairly long periods of time," "Once I get started, I intimately and fully reveal myself," and "I often disclose intimate, personal things about myself without hesitation" (Cronbach's $\alpha = .76$). These items were adapted from Wheeles & Grotz's self-disclosure scale 28].

Concern for strong tie network was measured in terms of how much SD was directed at the blogger's strong tie networks. Two items were used for this measurement: "My blog is directed at an audience of close friends," and "My blog

is directed at an audience of my family members" ($M = 4.4$; $SD = 1.42$; Cronbach's $\alpha = .74$).

Satisfaction was measured by adapting items from Diener, Emmons, Larsen and Griffin's life satisfaction scale [29]. Which prompts respondents to self-assess their state of being and to what degree they are pleased with it ($M = 4.85$; $SD = 1.12$; Cronbach's $\alpha = .87$).

Finally, *social sensitivity* was measured with seven questions ($M = 4.78$; $SD = .91$; Cronbach's $\alpha = .73$). There was a significant correlation between life satisfaction and strong tie network size ($r = .29$, $p<.05$), public awareness correlated with egocentrism ($r = .21$, $p<.05$), and perceived warmth correlated with perceived environmental comfort ($r = .241$ $p<.01$).

IV. RESULTS

A. Environmental Factors

A series of ordinary least squares (OLS) regression models were conducted to test the hypotheses. Recall that one set of factors that may influence OSD focuses on the physical environment. If an individual is physically located in an area that feels safe and supportive, they may be more likely to disclose online. Conversely, if an individual is located in an area that feels cold and alienating, they may be less likely to disclose. One of the most direct ways to measure the comfort level of an individual is by creating a simple index of comfortable objects in their near vicinity, as described in the Methods above.

Hypothesis 1 suggested that as the level of comfort, privacy and perceived warmth of a space increased, level of SD online would also increase. Further, the longer people lived in a given location, the more comfortable they should feel and hence more they should be willing to disclose. OLS regression was used to test the influence of physical elements including familiarity in terms of time spent in a location, privacy and perceived warmth on OSD. The overall model was significant, $F (3, 169) = 3.08$, $p < .05$, and explained 3.5% of the variance as summarized in Table I below.

TABLE I. COEFFICIENTS FOR ENVIRONMENTAL PREDICTORS OF ONLINE DISCLOSURE

Variables	Values		
	B	SE B	β
Age	0.097	0.019	0.370
Familiarity	0.381	0.146	0.186*
Warmth of Space	0.012	0.007	0.116*

*p < 0.05

Perceived warmth was a significant predictor ($\beta = .116$), partially supporting hypothesis 1. Results did not show a relationship between the comfort of a location and OSD. Age was included as an additional control variable, which was not significant. However, familiarity and perceived warmth of the space were. Privacy did not contribute to the variance explained and was removed from the table.

Hypothesis 2 proposed interactions between environmental sensitivity and comfort, warmth and perceived privacy. Of the three, only warmth was found to evidence an interaction. Accounting for that relationship in the model led to a significant improvement over the original, $F (5, 167) = 3.13$, $p < .01$. The model explained an additional 2.3% of the variance. Table II summarizes the results of the second model. Figure 2 below highlights the nature of the interaction between perceived warmth, perceived privacy, and online SD.

TABLE II. COEFFICIENTS FOR ENVIRONMENTAL PREDICTORS OF DISCLOSURE W/ INTERACTIONS

Variables	Values		
	B	SE B	β
Age	-0.015	0.009	-0.127
Familiarity	0.001	0.001	0.142
Warmth of Space	0.146	0.074	0.150*
Environmental Awareness	0.101	0.101	0.088
Warmth/Awareness Interaction	0.198	0.096	0.154*

*p < 0.05

Figure 2. Interaction Between Perceived Environmental Warmth and Privacy Awareness for OSD.
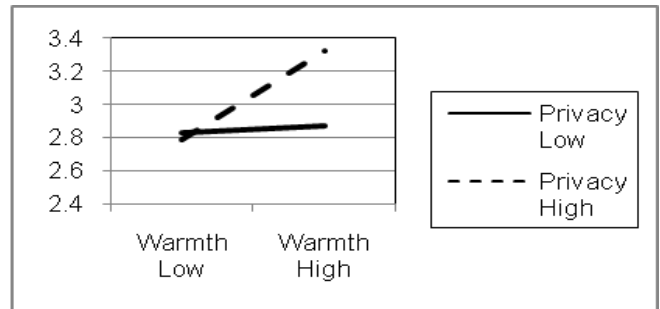
Despite the fact that the physical comfort of a space does not directly explain disclosure, evidence from the existing literature strongly suggests that physical comfort does predict perceived warmth of the space. In light of this evidence, we explored the possibility that the physical elements of the space predicted perceived psychological warmth.

TABLE III. COEFFICIENTS FOR PREDICTORS OF WARMTH OF SPACE

Variables	Values		
	B	SE B	β
Age	0.022	0.009	0.186*
Gender	0.412	0.183	0.167*
Comfort Index	1.618	0.497	0.242**

*p < 0.05 **p < 0.01

Using OLS regression, a significant model emerged: $F (4, 158) = 6.66$, $p < .0005$. The model explains 12.3% of the variance. Table III gives information for the predictor variables entered into the model. All three independent

variables were significant, although the comfort index had the largest effect in the model.

B. Social Factors

Hypothesis 3 suggested a positive relationship between social network size and the level of OSD. Once again, OLS regression was used to test the influence of life satisfaction, egocentrism, and targeting strong-ties on OSD. Results showed that Hypothesis 3 was partially supported. A significant model resulted: $F (2, 170) = 5.737$, $p < .05$, which explained 6.3% of the variance. Table IV summarizes the results for the model. Life satisfaction and egocentrism were significant predictors. Targeting strong-ties did not contribute to the variance explained and was removed from the table. Hypothesis 4 suggested that individuals who are more socially sensitive will be disproportionately affected by their social milieu, and was not supported.

TABLE IV.   COEFFICIENTS FOR SOCIAL PREDICTORS OF DISCLOSURE

Variables	Values		
	B	SE B	β
Life Satisfaction	-0.169	0.077	-0.164*
Egocentrism	0.163	0.063	0.191*

*p < 0.05

Despite the fact that strong-tie network size did not directly explain disclosure, evidence from the existing literature strongly suggests that friendships and other strong social ties play a critical role in the level of self-reported life satisfaction. In light of this, we also explored the possibility that the size of an individual's strong tie network will predict their life satisfaction, which then in turn predicts disclosure.

The model was significant, $F (4, 158) = 10.139$, $p < .0005$, and explained 18.4% of the variance. Table V summarizes the results of the model. Age and education were not significant predictors, but STN size and gender were.

TABLE V.   COEFFICIENTS FOR PREDICTORS OF LIFE SATISFACTION

Variables	Values		
	B	SE B	β
Age	0.012	0.007	0.116
Education	-0.123	0.090	-0.098
Gender	0.381	0.146	0.186*
Strong Tie Network Size	0.097	0.019	0.370**

*p < 0.05 **p < 0.01

V. DISCUSSION

As communication technology becomes increasingly ubiquitous, the physical location of these tools should be considered more carefully. One goal of this research has been to establish that perceptions about environments can explain in part the type and intensity of OSD. The results demonstrate that objective characteristics of places are less important then individual's perceptions of places as warm or familiar. These safe places seem to promote disclosure.

In light of these findings, it is perhaps not particularly surprising that the level of physical privacy reported for a space does not appear to be related to disclosure. Additionally, individuals who are more sensitive to their own internal psychological state seem to be disproportionately impacted by changes in the perceived warmth of their surroundings. This finding lends further credence to the idea that the psychological characteristics of a given space outweigh considerations of its physical elements.

Although physical characteristics may not directly influence OSD, they were found to contribute to individual's perceptions of the space. That is, environments that have been designed as physically comfortable have a higher likelihood of being perceived as psychologically comfortable. Although this linkage may be indirect, it nevertheless presents a strong argument for the role of physical spaces in encouraging or discouraging disclosive behavior.

As growth in technology allows for contact with others from places that were previously inaccessible, it has also introduced new capabilities for communicating with large groups of people simultaneously. Where previous generations might have placed phone calls or written letters to keep their friends and family informed; members of the current generation have the capacity to simply type and click. The second aim of the present research was to explore some of the potential impacts of social environment on OSD.

Much as individual perception of the physical environment seems to play a role in digital disclosure, awareness of the social environment is also a factor. The network of social obligations and relationships surrounding an individual seem to influence their disclosive behaviors. It seems possible that an individual with a large social network may be more likely to disclose online in order to share more efficiently. Conversely, if an individual has a small social network, they may be less likely to disclose online because there is less of an audience.

The results suggest that the actual size of an individual's strong-tie network is not directly related to their level or intensity of OSD. However, the degree to which an individual feels satisfied with their social life proved to be an important predictor; individuals who are less satisfied with their lives tend to disclose more online. Disclosure was not related to the degree to which an individual designated their strong-tie network as the target of that disclosure. This seems to suggest that dissatisfied individuals may not be concerned about who hears their complaints. Rather, they may be using OSD as a coping mechanism to deal with their disappointments.

The results suggest sensitivity to public social environment does *not* play a significant role in disclosive behavior. This finding may also help to explain why considerations of physical privacy did not influence OSD. If online disclosure is predominantly for the purposes of alleviating rather than communicating, privacy and social considerations may not be of paramount importance.

Although additional work will be necessary to further explore the relationships delineated here, the findings present evidence illuminating how the physical environment

influences communicative behaviors. Furthermore, the present research invites exploration into the potential relationships between the physical and social aspects of human interactions.

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