Understanding Perceived Gratifications for Mobile Content Sharing and Retrieval in a Game-Based Environment*

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Abstract. The confluence of mobile content sharing and pervasive gaming yields new opportunities for developing novel applications on mobile devices. Yet, studies on users' attitudes and behaviors related to mobile gaming, content sharing and retrieval activities have been lacking. For this reason, the objectives of this paper are two-fold. One, it proposes MARGE, a game which incorporates multiplayer, role-playing pervasive gaming elements into mobile content sharing activities. Two, it seeks to uncover the motivations for content sharing and content retrieval within a game-based environment. Informed by the uses and gratifications paradigm, a survey was designed and administered to 163 graduate students from two large universities. The findings revealed that perceived gratifications factors related to self, personal status and relationship maintenance were significant predictors for content sharing while information quality was a significant predictor for content retrieval. This paper concludes by presenting the implications, limitations and future research directions.

1 Introduction

The increasing popularity of mobile devices and their wireless networking capabilities offer new opportunities for social computing applications to be deployed on them, fostering interaction, content generation and participation amongst communities of users. The portability of mobile devices add a new dimension to user-generated content in which users can now co-create, seek and share information anytime, anywhere. Twitter, for example, is a micro-blogging and social networking service that allows content in the form of brief text messages to be created via a mobile device and posted on a user's Twitter page. Beyond ubiquitous content creation, context-aware, location-based information services are also now possible in mobile content sharing, allowing users to associate digital content with physical objects and locations in the real world, as well as receive content tailored to their specific needs [8]. Examples include ZoneTag [1] for photo sharing and Magitti [3], a context-aware mobile tour guide.

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Mobile content sharing applications allow users to co-create, seek and share multimedia content such as text, audio and video, socialize anytime, anywhere, and do these in new ways not possible with desktop applications. Despite these benefits, a potential drawback could limit a more widespread acceptance of their use. For example, the motivations for creating and sharing content are mostly intrinsic to users, and may include both social (e.g. getting attention) and personal (e.g. future retrieval) reasons [1], utilitarian or opportunistic behaviors [7], altruism and social exchange norms [17]. Likewise, the motivations for retrieving and consuming user-generated may include trust and reputation [4, 20], characteristics of the message [10], and characteristics of the creator, consumer and community [5, 13]. Put differently, current content sharing applications only provide limited extrinsic motivational mechanisms, and are typically confined to viewership counts, content/user ratings and discussion facilities.

Mobile devices also add a new aspect to play. Mobile games have evolved from casual games such as *Snake* to sophisticated multiplayer location-based ones in which players either compete and/or cooperate to achieve the games' objectives within a geographic area set in the real world. Also known as pervasive games, examples include early commercial successes such as *Botfighters* in which players take on the role of robots and search and destroy other robots within the vicinity, and *Undercover 2* where players visit real cities around the world, complete missions, and look for friends, enemies, and landmarks in real streets.

The confluence of social computing, mobile content sharing, and pervasive gaming yields new opportunities for developing novel, engaging applications for content sharing on mobile devices that can address the lack of extrinsic motivational mechanisms identified above. In particular, a central theme of these new applications is that content is created and shared as a byproduct of gameplay, and the gaming experience becomes an extrinsic motivator for content sharing activities. In addition, many of these games are social in nature, requiring multiple players to achieve the game's objectives. One example of a mobile game for data collection is the Gopher Game [6]. Gophers are agents that represent missions to be completed, and are carriers of information between players. As players move about their physical surroundings, they pick up gophers and help them complete their missions by supplying them with camera phone images and textual content. By helping gophers complete their missions, content sharing among players is achieved since other users may pick up these gophers and view the images and text associated with them. Such games are inspired by the success of Web-based casual games such as the ESP Game [22] and Google Image Labeler that use humans to label images to facilitate future retrieval.

While such games for mobile content sharing have their advantages, three possible shortcomings may be identified. First, the reward systems in existing games tend to be basic, and are often similar to existing mechanisms found in current mobile content sharing systems, including reviews and ratings [e.g. 6]. Next, current mobile content sharing games may be characterized as casual games that have simple rules, allowing gameplay to occur in short bursts [2]. The lack of complex game mechanics and depth of play may eventually cause the novelty of the game to lose its luster. Third, there is very little work done in determining if and how these games motivate users to share content, and if users are willing to retrieve and consume such content generated from gameplay. We argue that a better understanding of users' attitudes and behaviors are

necessary to implement systems supporting mobile content sharing and retrieval activities more effectively.

The objectives of this research are two-fold. The first is to address the shortcomings of current mobile content sharing games by proposing MARGE (Mobile Alternate Reality Gaming Engine). MARGE incorporates multiplayer, role-playing pervasive gaming elements into mobile content sharing activities, allowing users to literally play with their content. The second is to uncover the motivations for content sharing and content retrieval within a game-based environment afforded by MARGE. Here, we employ the uses and gratifications paradigm [11], which essentially examines how and why people select specific media to meet their needs or to obtain specific gratifications.

The remaining sections of this paper are structured as follows. Section 2 provides an overview of the related work. Section 3 describes our mobile content sharing game. Section 4 presents the methodology of the study while Section 5 discusses our findings and analyses. Finally, Section 6 discusses the implications of this work as well as opportunities for future research.

2 Related Work

Web-based applications that blend content sharing and gaming elements have emerged recently. Also known as Games With A Purpose [23], content is created and shared through gameplay. The ESP Game [22] is such an example in which two unrelated players are tasked to create matching keywords to randomly presented images within a given time limit. Points are earned based on specificity of the keywords, and coupled with a countdown timer, these elements add excitement and hence motivation for players. While players have fun with the game, the matching keywords (content) can be used as tags for these images, and if sufficient data is collected, these tags can be used improve the performance of image search engines. Other examples include Google Image Labeler (http://images.google.com/imagelabeler/) which is a variant of the ESP Game, and a collection that can be found at the Games With A Purpose site (http://www.gwap.com).

Similar ideas that blend content sharing and gaming can also be seen in mobile applications. One such example is the Gopher Game [6]. As mentioned, gophers represent missions to be completed, and are carriers of information between players. The game is location-based and players collect gophers as they move about their physical surroundings. A player helps a gopher complete its mission by supplying it with camera phone images and textual content based on a task description. This information is submitted to a community of judges, and players earn points depending on the quality of the content submitted. Using these points, players can create new gophers and participate in other in-game activities. Through the process of helping gophers complete their missions, content sharing among players is facilitated because other users may collect these gophers and view the images and text associated with them. In MobiMissions [9], content sharing is accomplished through the completion of missions, which are defined by sequences of digital photographs and text annotations associated with specific locations. Players create missions for others to undertake, search locations for available missions, and create responses to missions created by others. To complete a mission, a player has to capture up to five photographs and add up to five text annotations. This content can then be shared with other players.

Research reported in the literature concerning these games suggests that users do find them entertaining and some useful content can be generated through gameplay (e.g. [9, 6]). Despite these encouraging results, the underlying dynamics that explain why users find gaming and content sharing appealing have not been well explored. Clearly, a theoretically-informed perspective ensures that applications adopting this genre of gaming provide facilities that sustain players' motivations both in creating and retrieving content. Otherwise, such applications are unlikely to succeed. Hence in our research, the uses and gratifications model [11] is employed to study content sharing and retrieval in a game-based environment. This model was originally developed to examine how and why individuals use and adopt mass media in their everyday lives [11]. Subsequent studies reveal that mass media are used for the purposes of both entertainment and utility [7], and that individuals seek gratifications in mass media use based on their needs and motivations [16]. Recently, the scope of such research has been extended to technologies, software and services, although this model has yet to be employed in a context related to ours. For example, [14] studied mobile phone usage through a uses and gratifications perspective with the goal of understanding how people use mobile telephony technology. From an analysis of 417 respondents, major gratification factors included affection and sociability, immediate access, entertainment, reassurance (safety) and fashion and status, and these had a strong influence on how the mobile phone was used. The findings revealed that talking to immediate family members provides affection gratifications while using mobile phones in cars, buses or in malls and restaurants offers immediate access gratifications. Next, [21] employed the model to examine why people play video games and the types of gratifications they would experience. A survey of 550 respondents yielded six uses and gratifications dimensions including competition, challenge, social interaction, diversion, fantasy and arousal. Different patterns of playing behavior were also found, and these were associated with the different uses and gratification dimensions found.

3 Introducing MARGE

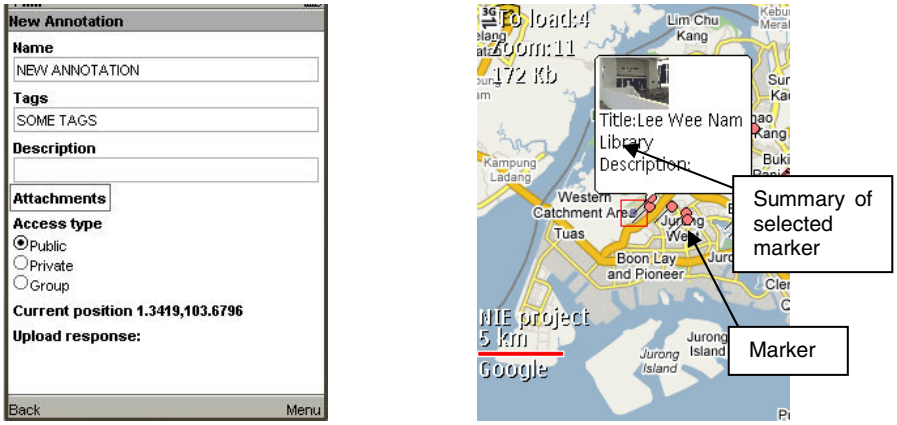
MARGE (Mobile Alternate Reality Gaming Engine) is a system that realizes our goal of combining gaming elements in a mobile content sharing application. Play is intertwined with the collaborative creation, seeking and sharing of information such that these activities become the mechanics of gameplay. Unlike the casual games reviewed, we create a persistent layer of alternate reality [12] over digital information associated with the real world by weaving a storyline into mobile content sharing. Put differently, we introduce multiplayer role-playing pervasive gaming elements into mobile content sharing activities.

MARGE comprises the facilities for mobile content management, retrieval and discovery, and importantly the game engine that supports our approach to gameplay. Due to space constraints and the objectives of this paper, we will only highlight the major aspects of the user interface and game mechanics of the system.

3.1 Content Sharing Features

Using MARGE, players have an interface for creating, seeking and sharing content on their mobile devices, similar to the facilities offered by existing applications (e.g. [8]).

Here, content refers to location-based annotations, each comprising attributes such as title, tags, textual information, multimedia content (e.g. images) and users' ratings for that annotation (see Figure 1a). Other implicit attributes are also captured such as contributor name, location (latitude and longitude), and date. Annotations are displayed as markers on a map-based interface (see Figure 1b). Here, the map offers standard navigation features such as pan and zoom.



(a) (b)

Fig. 1. (a) Creating an annotation (b) Map-based visualization Creating and viewing annotations

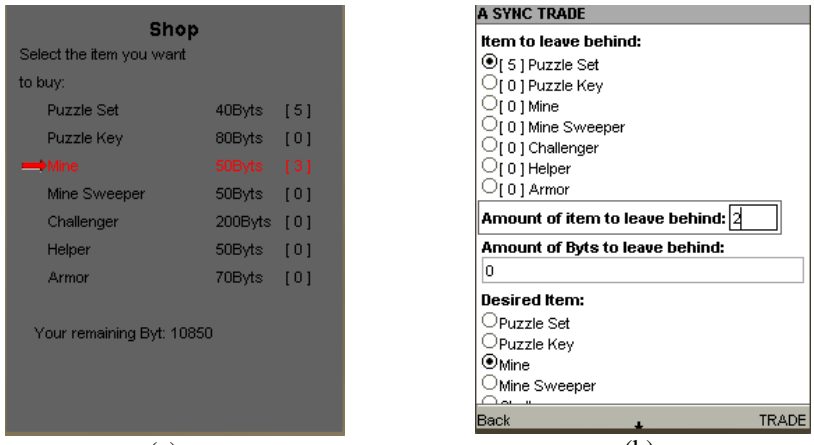
3.2 Gaming Features

At the same time, MARGE gives users the opportunity to concurrently play with their content, by taking on a role and progressing through a virtual world by interacting with other players and accumulating points, similar to a role-playing game. MARGE players start at the lowest level of a role's hierarchy and work their way up by earning points. Points are earned or spent through a player's actions and the actions of others, which may include the following.

- **Collaborating.** Players earn currency (called *byts*) by contributing location-specific content or give ratings to existing content. These points can then be spent to acquire game tools and access other game-based features.
- **Competing.** Players may acquire traps or puzzles and lay them at various locations to prevent content from being accessed by others, or to inflict damage to other players. For example, a player encountering a puzzle (e.g. a slide puzzle) will have to solve it before being able to access content. A player stumbling upon a trap may cause him/her to lose byts and the trap setter to gain them.
- **Guiding.** This involves creating missions which comprise a list of locations for other players to visit. Creation costs byts to prevent a proliferation of frivolous missions, while embarking on a mission is free. Before embarking on one, a player can see a description of the mission as well as comments given by other players. Upon successful completion of mission (physically visiting all locations), the

player and the creator earns byts. The player is also given the opportunity to rate and comment on the mission.

- **Transacting.** MARGE provides a variety of game items that include traps, puzzles, items that negate traps and puzzles, and so on. These may be purchased from a virtual shop (Figure 2a). Here, players simply specify the item and quantity desired. Items may also be traded with other players by specifying the desired items for trading. Trading may be synchronous, in which communication is done between two parties in real-time, or asynchronous (Figure 2b), in which items are left at a specific location and an interested party may accept the trade if they encounter it.



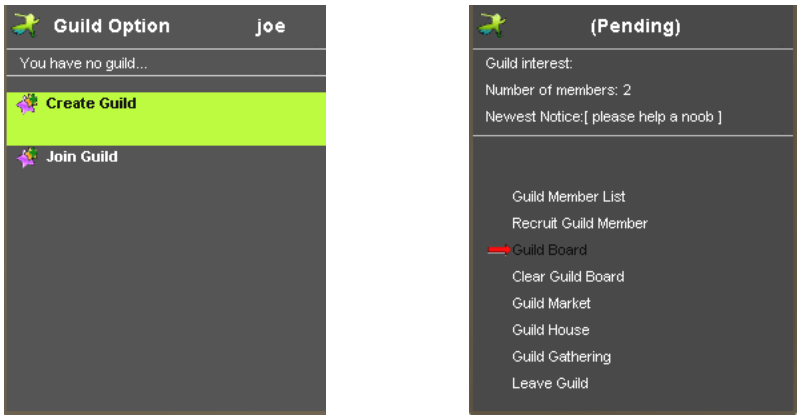
(a) (b)

Fig. 2. (a) Buying items from the shop. (b) Trading items with other players. Buying and trading game items.

- **Socializing.** MARGE supports the creation of guilds in which players with similar interests may join, socialize and forge alliances (Figure 3a). Here, players may exchange messages that are accessible only to guild members, trade items that may not be accessible by non-members, and participate in events and gatherings. Players may request to join a guild or be recruited by existing members. Any player with sufficient byts can create a guild, and to further prevent proliferation of guilds in the system, a newly created guild remains in a pending state until at least three members join (Figure 3b).

In MARGE, gameplay is open and undirected, allowing a player to explore information anchored in the physical world, while interacting with other players through the game mechanics layered as a virtual world on top of this information. The game is persistent, meaning that the game state and items remain active independent of whether any particular user is logged in, and players have the flexibility to decide how much involvement with the game he or she desires. Here, we aim to cater to a wide spectrum of users, by allowing MARGE users to vary the levels of usage of the gaming features. For hardcore gamers whose interest can be sustained primarily through gameplay, they

can explore the storylines, roles, in-game quests and items in greater depth. For casual gamers, MARGE offers a rich gaming environment with a multi-faceted reward structure that keeps them engaged when their schedules permit. For non-gamers, gameplay can be dislodged from content sharing activities completely if desired. Further, by exploiting the duality of the "player-as-user" and "user-as-player" dynamics [2], users lacking the propensity to share information may be motivated to do so.



(a) (b)

Fig. 3. (a) Main guild page. (b) Guild features. Socializing through guilds.

4 Methodology

To measure perceived gratifications for content sharing and retrieval from using MARGE, we developed a survey instrument based on constructs from past uses and gratification studies [e.g. 7, 14, 15, 18]. Specifically, according to the findings reported in past studies, several factors (i.e. time management, trust, sociability, leisure, relationship maintenance, personal status, reassurance) were identified as potential motives or perceived gratifications behind usage of MARGE, and were incorporated into the survey. For example, perceived gratifications questions to measure relationship maintenance include "I use the application to share information to help others", "I use the application to share information to thank others", and "I use the application because I am concerned about others". A total of 20 question items were used to assess perceived gratifications from the use of MARGE for content sharing and another 20 items were used to assess perceived gratifications of MARGE for content retrieval. The actual questionnaire cannot be included in this paper due to space constraints. Nonetheless, it can be obtained from the authors upon request.

Graduate students from two large universities in Singapore were invited to a presentation on the use of location-based content sharing using mobile devices. The concept of MARGE and its gameplay features were also introduced during the presentation. To help the students understand how MARGE is played, four possible usage scenarios were presented. These scenarios included using MARGE for: (1) creating content and planting puzzles; (2) retrieving and rating content; (3) trading game items

with other players; (4) embarking on missions; (5) joining a guild. Thereafter, the survey, which sought to determine the perceived gratifications in retrieving and sharing content using MARGE, was administered. Participation was voluntary and anonymous. A total of 163 students participated in the written survey of which approximately 51% were male, 45% female and the rest not indicated. The majority of the respondents (70%) were between 18 to 29 years of age, and most (85%) were from the computer science and engineering disciplines, with the remainder from business, arts and the social sciences.

5 Data Analyses and Results

Principal component factor analysis with varimax rotation was run to determine the potential groupings of the perceived gratifications items. Varimax rotation was used to better account for expected correlations among potential factors. Accordingly, several factors emerged with eigenvalues greater than 1.0. A total of 4 items under content sharing and 6 items from content retrieval were dropped during the analysis due to high cross loadings to multiple constructs.

Eight distinct perceived gratifications factors emerged from the factor analysis with 4 perceived gratifications factors supporting content sharing and another 4 perceived gratification factors supporting content retrieval. The 4 factors for sharing are discussed next. The first factor consisted of 8 items which were related to satisfying needs of the individuals which we labeled as SELF. Examples of items in this factor include "need to control", "need to interact" and "need to experiment with my identify". The second factor consisted of 4 items which were related to personal status (e.g. to make me look good) which we labeled as "PERSTATUS". The third perceived factor consisted of 2 items was related to leisure purposes and so was labeled as LEI. Examples of items in this factor include "helps me to combat boredom" and "helps me to pass time". The last factor consisted of 2 items which centered around issues related to relationship maintenance which we labeled as RELMAINT. Items included "to help others" and "to thank others".

The 4 perceived gratifications factors for content retrieval are described as follows. The first factor consisted of 5 items which were related to the quality of the information and so we labeled as INFOQUAL. Examples of items in this factor are "I trust the information", "I know the information will be accurate", and "I can get the latest news and updates". The second factor was labeled as SOCBOND and it was related to social bonding issues. This factor consisted of 4 items (e.g. "to keep in touch with people"). The third factor consisted of 4 items and which were related to the process of searching for people, location and information (i.e. "easy to get information I need", "helps me to find locations", "I can look for people to interact"). This factor was labeled as SEARCH. The last factor for content retrieval consisted of 2 items which were related to time management and was labeled as TIME (e.g. "immediate access to information anywhere anytime".

The reliability constructs for the 8 gratification factors were assessed using Cronbach's Alpha. The results exhibited acceptable alpha values (i.e. ranged from 0.6 to 0.8) for the given sample size.

Statistical analyses were carried out using least squares regression on the 2 models. The first model (Model 1) examined the associations between the extracted 4 perceived gratifications factors from the factor analysis and the intention to use MARGE for content sharing. The second model (Model 2) examined the associations between the 4 extracted perceived gratification factors from the factor analysis and the intention to use MARGE for content retrieval. Table 1 below shows the regression models used.

Table 1. Regression models

Model 1: Usage Intention $_{Sharing} = f$ (SELF, PERSTATUS, LEI, RELMAINT)
Model 2: Usage Intention $_{Retrieval} = f$ (INFOQUAL, SOCBOND, SEARCH, TIME)

Note: SELF: Self, PERSTATUS: Personal Status, LEI: Leisure, RELMAINT: Relationship Maintenance, INFOQUAL: Information Quality, , SOC: Social Bonding Needs, SEARCH: Searching process for locations, information and people , TIME: Time Management

Table 2. Regression Results

Model 1				**Model 2**			
	Coeffs	t-value	Sig.		Coeffs	t-value	Sig.
SELF	0.22	2.61	0.01**	INFOQUAL	0.38	4.03	0.00**
PERSTATUS	0.17	1.92	0.06+	SOCBOND	0.00	0.03	0.97
LEI	-0.02	-0.27	0.79	SEARCH	0.16	1.32	0.19
RELMAINT	0.22	2.80	0.01**	TIME	0.15	1.62	0.11
Adjusted R^2	0.18				0.29		
F-Stats	9.90**				16.00**		

Note: * $p < 0.05$; ** $p < 0.01$; + $p<0.10$

Note: SELF: Self, PERSTATUS: Personal Status, LEI: Leisure, RELMAINT: Relationship Maintenance, INFOQUAL: Information Quality, , SOC: Social Bonding Needs, SEARCH: Searching process for locations, information and people , TIME: Time Management

Results from the analyses are shown in Table 2. The regression results of Model 1 show that three factors (i.e. SELF, PERSTATUS and RELMAINT) are significant in predicting the intention to use MARGE for content sharing. Interestingly, our results show that the association between intention to use MARGE for content sharing and for leisure purposes (e.g. combat freedom or to pass time) is not significant. The regression results of Model 2 show that only one factor (i.e. INFOQUAL) ($p<0.01$) is significant in predicting the intention to use MARGE for content retrieval.

6 Discussion and Conclusion

The objectives of the present paper are two-fold. We first present MARGE, a mobile application that blends content sharing activities with gameplay. Here, gaming features

serve as an extrinsic motivator for content sharing and retrieval, and differs from standard mobile content sharing applications where motivations for use are mostly intrinsic. Next, we conducted an exploratory study that seeks to understand the basic motivational factors influencing people's intention to use MARGE (and in general, its game genre) for content sharing and retrieval. In our work, we employed the uses and gratifications paradigm. Our study highlights two important points. First, our results indicate that the motivations to share content are different from the motivations to retrieve content. Second, through the lens of the uses and gratifications paradigm, our results show that content sharing is a much more complex process than content retrieval. Specifically, the motivations behind content sharing arise from multiple sources – self (satisfying personal needs), relationship maintenance, (i.e. enjoy helping others), and personal status (i.e. to look good). In contrast, the motivation behind content retrieval was centered mainly around the quality of information such as trustworthiness and accuracy.

Our work has yielded the following implications. The different perceived gratifications for mobile content sharing and retrieval would indicate the need for different mechanisms that would motivate such activities. Whereas current mobile content sharing applications have tended to implicitly consider sharing and retrieval as a single construct, we argue that by understanding the differences in gratifications between these two activities, developers would be better informed to implement applications supporting them more effectively. From an application design perspective, it appears that more features are required to better support content sharing activities. In particular, such features would have to address the gratifications factors of self, personal status and relationship maintenance. In this regard, the incorporation of gaming mechanisms in MARGE would be helpful. For example, the ability to play with content such as planting puzzles or creating missions would help to sustain one's interest in content creation. Further, the accumulation of points and ranking up within a role serve to enhance a player's personal status. As well, relationship maintenance can be accomplished through trading of items, joining guilds and creating content that meets other users' needs.

Next, the gratifications associated with content retrieval appear to be much simpler, that of obtaining quality information to meet one's needs. Here, features should be put in place to help users make such decisions. In MARGE, support includes content ratings, commenting on contributions, and viewing of users' profiles. Finally, it was interesting to note that the other perceived gratifications factors that emerged from the factor analysis (i.e. SOCBOND, SEARCH, and TIME) were not statistically significant in predicting the intention to use MARGE for content retrieval. This is consistent with the task-oriented nature of information retrieval as suggested in past studies [19]. The implication is that an application designed for this purpose should provide efficient and effective access to information. In the case of MARGE and similar games, users should ideally have immediate access to content and bypass gaming features if necessary. Hence, we have deliberately designed MARGE such that players have the liberty to determine the level of involvement with the game. This can range from enjoying a full-featured gaming experience to focusing only on content sharing and retrieval without gameplay.

Caution, however, should be exercised when interpreting our results because the nature of this study may reduce the generalizability of its findings. Specifically, the

majority of the respondents was from the IT and engineering backgrounds, and was between 18 and 29 years old. Replication of this study in other contexts (e.g. other age-groups, different backgrounds) or in a specific domain (e.g. tourists, students) would be useful to understand the basic motivational factors influencing people's intention to use MARGE or similar applications. Further, expanding the study to compare MARGE with other mobile content sharing applications would allow researchers to investigate the impact of gameplay and its influence on why people share and retrieve content via mobile communication devices.

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