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GameFoundry: Social Gaming Platform for Digital Marketing, User Profiling and Collective Behavior

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Abstract

Traditional marketing has been using the Internet as a mean of transport for advertising, usually through the use of banners or sponsored links. However, new tendencies in digital marketing are focusing on added interactivity, where the use of games as a marketing tool is not new. Moreover, the portion of population engaged in social networks is quickly increasing, turning these into preferred targets for marketing actions, considering the potential of retrieving valuable personal, demographic and geographic data. Forwarding recent advances in data mining and knowledge extraction to this model would therefore turn it into a powerful tool to measure the impact of marketing and branding actions, while reinforcing marketing strategy. In this paper we present *GameFoundry*, a new online platform that aims at creating an innovative Web Game Engine and Game Distribution system, which will provide support for knowledge management and game activity monitoring based on simple network games. It is intended to give the users the possibility of playing games in several environments, platforms and social networks, and to provide the clients of this product the ability to create, independently, a set of games with proprietary contents, distribute them over the network and have constant access to game activity, statistics and advanced user profiling, collective behavior and predictive models.

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Keywords: Social Network Analysis, Social Gaming, Data Mining, Social Media, Digital Marketing, Branding, User Profiling, Collective Behavior

1. Introduction

Many marketing strategies have been developed and deployed all over the last years. No matter how many trends come and go, they will always be oriented by the four P's of marketing: product, pricing, promotion and placement. Although the Internet is becoming more and more part of our lives, traditional marketing is still the preferred mean to reach specific groups of consumers, mainly due to its person-to-person approach and tangibility, despite being expensive and hard to track the results. However, with the rise of Web 2.0 technologies,

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powering new social network and media platforms, marketing experts couldn't ignore such disruptive movement and are adapting or creating new strategies and models that exploit new possibilities given by these tools, namely the highly measurable real-time results, the ability to drill down into consumer demographics and the direct communication to groups or even individual consumers.

The universal pervasion of social networks in everyone's life made companies realize that they have a quite accessible direct marketing vehicle they can use to carry their digital advertising. Tying marketing with social networks provides the possibility of getting some consumer personal data (allowing geodemographic segmentation), providing business and marketing analysts with a vast array of social network analysis material. This will eventually trigger the development of new methods to capture customer and consumer mindsets, market trends, etc. The data set that can be retrieved through these new means of interaction with advertising can now be expanded with many more features, ranging from personal likes and other demographic data to political views and assorted life events extracted from status messages. Ethics and privacy usually go hand in hand with this sensitive area, but in general these processes have been accepted and regulated, being now a common practice and behavior and considered as extremely valuable assets for business and marketing analysts.

One of the rising marketing trends is game-based marketing. People usually engage in casual entertainment, so games are powerful intrinsic motivation triggers, leading people to interact with objects (either real or virtual) that in a way or another carry advertising material. This not only fulfills the primary objective of advertising, but also allows the aforementioned data gathering. Now, if the game could be structured and designed in order to extract more specific knowledge, that could lead to powerful information extraction that may not only identify social profiles of the people that played the game, but also identify clusters of profiles based on a specific event of the game. This event could perfectly be a simple question attached to the game. Games can also be very useful in completely different situations, like identifying health problems, especially in elderly people. For instance, by measuring responses and their times, it can be possible to detect loss of memory, cognitive impairments or even sensory-motor problems.

2. State of the art

2.1 Social Network Analysis

The study of social networks allows the mapping and measuring of the relationships between actors while sub-grouping can tell how the network behaves as a whole. The study of behaviors, namely collective behaviors, is extremely important when talking about social network advertising, leveraging the paradigm of "homophily" (McPherson, M., Smith-Lovin, L., & Cook, J, (2001). Zeng et al. (2011) analyzed a micro blog as a social network collecting knowledge, such as central users and nodes, which have a higher rate of information dissemination (Zeng, W., Huang, Y., & Jiang, L., 2011). That knowledge was then used to apply more efficient marketing strategies in order to reach the right customers. Zadeh et al. (2008) made a simpler approach and did some mining in social network interactions in order to deliver targeted advertisements (Zadeh, P. M., & Moshkenani, M. S., 2008). Considering Email and Internet Messaging as the most used social services back then, the authors tried to identify groups of users by mining flowing data. It was possible to clearly identify the major topics of interest for a specific user, which could lead to marketing strategy improvements, namely in what it takes to targeted advertisements.

It is possible to improve marketing response accuracy with the help of data mining techniques, even the rudimentary ones. J. Surma and A. Furmanek strongly supported this idea and empowered some work based in the use of Classification and Regression Trees (C&RT) to generate rules, which would determine a specific group of advertising recipients (Surma, J., & Furmanek, A., 2010). Basically, tree-building algorithms should determine a set of *if-then* logical conditions that allows accurate prediction or classification of cases.

2.2 Social Games and Marketing

According to eMarketer, the number of social gamers in the US increased from 53 million in 2010 to more than 80 million today (eMarketer March 2013). Marketing inside social games poses a huge opportunity for business as the number of advertising views is related with the number of gamers. Also, Nielsen's report states that 14% of the people bought a product after seeing it in a social ad (Nielsen April 2012). Furthermore, 26% liked the ad and 15% shared it, which led to advertising propagation around the social network. As of today, social games advertising can be more than just popping something up. For instance, FarmVille players have the chance to get a McDonald's hot air balloon.

2.3 *Related work*

Game Treat (http://www.gametreat.com/) is a web application which allows creating personalized casual games and embedding them in a website. The main idea around this concept is to make the website visitors to stay longer and to come back, therefore increasing the website traffic. Besides being captivating, the embedded games provide a Facebook sharing system, exposing the customer website in the social network, thus increasing the number of potential visitors. Players' information is not kept for further analysis, so this product does not provide any knowledge acquisition system to support future marketing strategies. GameZBoost. (http://www.gamezboost.com/) is similar to GameTreat but additionally it provides a backend report. It also allows embedding fully customized games and has Facebook and Twitter integration. Socialzed. (http://socialzed.com/) is a gaming platform focused on Facebook. The idea behind this platform is to provide a customized look and feel for each customer, allowing them to create games and contests for the Facebook community. Socialzed also supports simultaneous contests, of which winners are automatically determined. As each game keeps its own registry, users can see, at any time, the participants list or the winners. Socialzed also claims Google Analytics integration, which can be used by customers in order to get valuable information, although without applying any data mining techniques to the collected data.

In this work we introduce GameFoundry, an online platform, which gives users the ability to create and distribute customized casual games for a wide range of devices. This project is being developed in a joint cooperation with Ubbin Labs (http://www.ubbin.com/), a portuguese SME dedicated to web and social networking technologies, and is being partially financed by national public funding (QREN). GameFoundry's innovative side comes from the fact that it aggregates all the ideas described throughout this section. Besides being a social games platform, GameFoundry uses a set of data mining algorithms to evaluate the users' behavior and generate user profiles based on game data, therefore providing valuable knowledge to the publisher. Like most of social games, it is also possible to include ads, but nevertheless the publisher can add interactive advertising in the form of a quiz, for instance. This works not only as an advertising campaign but also as a mean to collect valuable information about a particular brand or product to support decisions for future marketing actions.

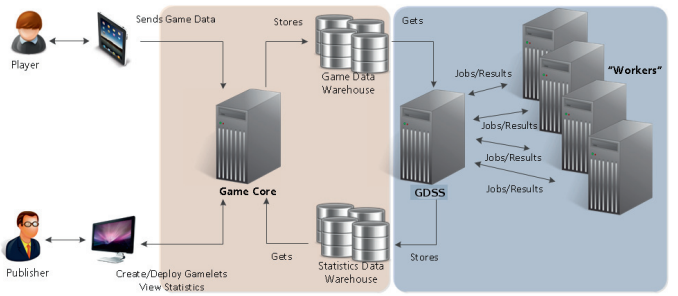

Figure 1 - GameFoundry Architecture

3. Platform mechanics

The GameFoundry project aims at allowing customized online games to be played by an audience, while serving marketing oriented purposes. There are four different types of games planned for the project: quizzes, crosswords, differences and memory. Until this moment, only quizzes are fully implemented and operational.

As already mentioned, this project makes use of the strong influence and presence that social networks, such as Facebook and Google+, have in people's lives, in order to not only reach a broader range of audience, but also to build a knowledge platform from which information with high marketing-value can be extracted. Based on players' preferences and characteristics, demographic and geographic data, contextual information and games results, it became possible to populate such platform. Furthermore, to encourage participation from consumers and enrich the aforementioned knowledge database, gamification concepts can be applied on top of the existing architecture. Prizes for the top performers can already be awarded, but things can be taken to a completely different level with badges, leaderboards, etc.

To support the necessary infrastructure, the GameFoundry platform was developed with three major modules in its backbone (Figure 1): a) the GameCore; b) the GDSS (Game Data and Support Service); and c) the Social Game Containers. The three serve very distinct purposes within this project. Briefly describing each component, the GameCore is responsible for the storage and management of data related to clients (also referred to as publishers), consumers (or players) and games, while also acting as an interface between publishers/players and the platform through full-featured web portals. On the other hand, the GDSS stores and processes all data related to players and the matches they played. Finally, the Social Game Containers are the platform-dependent envelope applications that let players play the games while dealing with all the processes of authentication/authorization, geo-location, event-recording, etc., eventually sending all data to the GDSS. In the next sections each of these three modules will be detailed.

Although this project is currently oriented to marketing purposes, it can actually be adapted to any context in which user interaction is required while both user behavioral profiling and monitoring is performed, in order to extract relevant information and statistics from the collected data. Both the Social Game Containers and the GDSS were designed in a quite generic fashion so they can be adapted to different contexts than marketing, including non-gaming contexts.

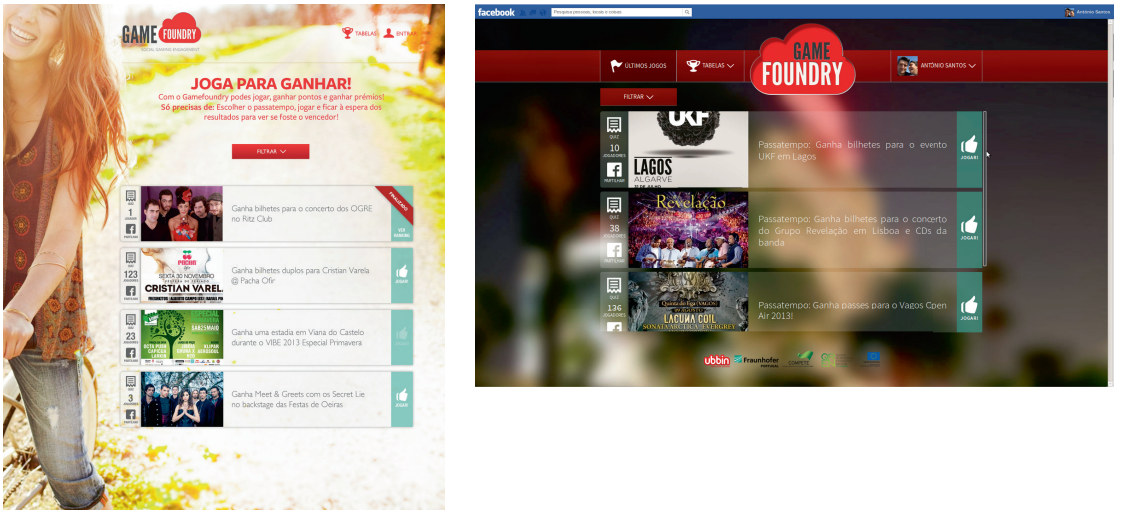

Figure 2 - a) Player's Web Portal ; b) Facebook Container

The GameCore is in its essence the supporting backend for the service model. It is where all the data related to games, publishers and users (IDs, personal info, credentials, etc.) is stored and managed. It supports two web portals which are the main interfaces of the service. The first web portal is dedicated to publishers, through which they can create, customize, publish and manage their games and have instant access to all the data and knowledge generated by the games, including statistics and data mining results (user profiling). A second web portal is mainly dedicated to the users/players (Figure 2a), and is basically a central place where they can check all the available games, play them (directly in the portal or being redirected to the page hosting the game) and have access to their profile, leaderboards and other social stuff.

The publishers are offered with a quite powerful tool to create, publish and manage their games. The system was designed around the concepts of Gameplates and Gamelets. Gameplates are templates for each game type (quiz, crosswords, differences, memory), which are used to start creating a new game. They consist of the main structure of each game, implemented using Web 2.0 technologies (HTML5/CSS3/Javascript), which is divided in three segments, following the authentication interface: Option Selection, Target Questions and Game. All the segments can be fully customized, including the visuals and the contents. The first two segments are optional. The first segment, Option Selection, exists to provide more flexibility.

For instance, it can be used to ask the player to which date he is applying to in case of a multi-date contest. The second segment, Target Questions, although optional, is probably the most important one and the questions/answers defined here are the ones that will be mainly used for data mining and user profiling, as they are basically marketing-oriented questions and are not considered for game score. Finally, the third segment is the game itself. After designing the game, the publisher can select to which platforms it should be available (Web, Facebook, Mobile). At the end, the game is created and is now a Gamelet, being available at a URL, which will be provided to the containers so they can render it. The publishers can manage their published games at any time and have access to a wide set of statistics and user profiling data, which will be detailed in section 3.3.

Currently, the portals are still under development and are not open to public.

3.2 Social Game Containers

The game container is the element that provides the games to the users, being available for different platforms: Web, Facebook and Mobile (Android/iOS apps). Despite being available for different platforms, its working model is always the same. It is mainly responsible for providing the authentication system, loading and providing the games, while collecting data in the background and later sending it to the GDSS. The data that is collected by the container is related not only to the game being played, but also contextual information. More precisely, the container is able to monitor: a) the player's location (country, city, GPS coordinates); b) used device info (brand, model and operating system); c) the game duration; d) a list of key events related to the segments of the game and the timestamp in which they occurred. For instance, during a quiz a list of events would be answers to questions; e) the game score. The games and the container interoperate through the use of an API that is provided by the container and which can be used by the game to submit/retrieve data. This allows an almost complete decoupling of the game interface from the GameFoundry operating model. This way, this model can change at any time without affecting the games. In order to play, the user must be authenticated and all containers support Facebook or Google authentication.

All containers can be started in two modes: direct game access or game list. The first orders the container to skip the list of available games for that container and go directly to a specified game. The second orders the container to show first the list of available games and allow the user to select, which game(s) he wants to play. Additionally, the user has access to his profile, leaderboards, etc. That said, it's clear that it only makes sense to use the first starting mode in the Web container, as it will be mostly used to embed a specific game in a web page. The second starting mode is mostly used in the rest of the containers (Facebook, Mobile), as well as in the user's web portal.

When the player finishes a game, the container sends all the data it has collected to the GDSS, so it can be further processed and relevant information can be extracted from it.

At the moment, only the Web and Facebook containers are publicly released. In the Facebook container, it's now possible for users to check the available games, the ones that have ended and the ones the user has played. Also, it is possible to view a general leaderboard, as well as his own profile (Figure 2b). In the end, the Facebook container, the mobile containers and the users' web portal should all be inline and with the same set of features.

3.3 Game Data and Support Service

The Game Data and Support Service (GDSS) is the component that is in charge of processing all the data and events resulting from the interaction between the players and the games and then provide useful information to the publishers, resorting to statistical analysis and data mining techniques.

The GDSS is divided in three main modules (Figure 3): (i) communication module, responsible for the communication with the GameCore and the Containers; (ii) analytics module, responsible for the statistical analysis and the implementation of the data mining techniques; (iii) database module, which has to store the relevant information about the players, games, matches and the calculated results. When a player completes a match in one of the games available, the container will send the match summary information to the GDSS, so that it can later perform its analysis. When the number of matches waiting for analysis is higher than a configurable threshold (currently 5% of the total number of matches), the GDSS will add a job to its message queue. Once the system is available and capable of executing the requested job, it will execute the analytic engines in order to obtain the statistical and data mining results, using stream mining techniques.

One of the most distinctive features of this solution is the vast set of information that is available to the publisher, either in the form of statistics or as results of applying advanced data mining techniques. The statistics set aims at providing the publisher with detailed data needed for user profiling based on the overall data of the submitted game or based on each possible answer of each target question (if any). The statistics are mostly related to the data retrieved from the Facebook profile, namely the gender, age, relationship status, language, and the interests (music, books, movies and TV). The data mining results are still being worked out but they will be provided in three use cases: the first is just the result of applying the clustering algorithm (*K-Means*) on all data features of the submitted game. Each identified cluster will be provided with its typical user profile. The second use case is by applying a classification algorithm (*Decision Trees*), which will provide the differing features between the user profiles for each answer in each target question. Finally, the third use case provides the results of applying association rules techniques (*FP-Growth*), which will provide rules in which the answers of the target questions will be found as premise or as conclusion.

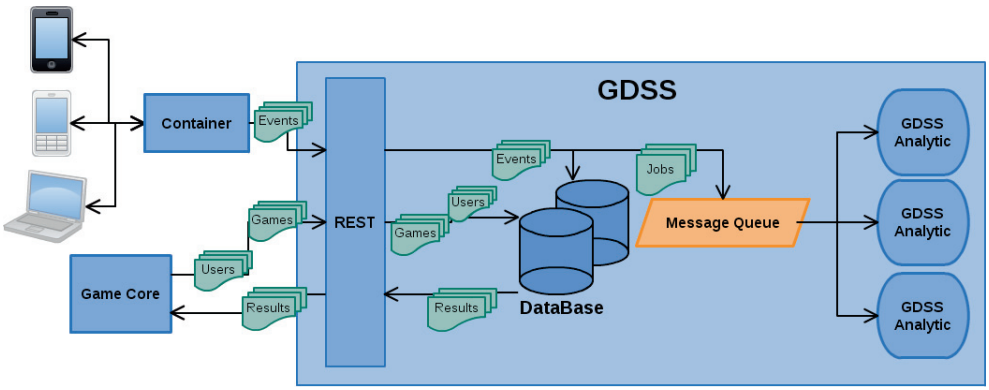

Figure 3 - GDSS Architecture

4. Results

Despite the project is still running to its last quarter, it is already possible to show some interesting results that come from real tests. Although the product is not yet ready or officially available, Ubbin Labs acted as being the first client and was able to publish some games as contests in its well-known music portal Palco Principal (http://www.palcoprincipal.pt/). This portal regularly publishes contests in order to award the participants with tickets to music events. By using GameFoundry, not only the contests were more visually appealing, but it also was much easier to design and deploy the games, as well as identifying the winners and notifying them, and access all the aforementioned statistics and data mining results sets. Since the beginning of the trials, 18 contests were published, all in the form of quizzes, and more than 2300 different users have played.

The set of statistical data is quite detailed and one can find demographic info in a quite visually structured way, although currently for testing since it is still to be designed and integrated into the clients/publishers web portal (**Error! Reference source not found.**a,b).

Other interesting data is related to geolocation. This information can be rendered by, for instance, using the heatmap tools featured in Google Maps API (**Error! Reference source not found.**c). As it is expected, almost all the participants are from Portugal, but it can spotted in some cases that there are some participants from other countries. There's also the possibility for the publisher to retrieve an Excel file with all the data of the game, without explicit individual identification of the users.

Although the data mining algorithms are not yet integrated into the GDSS, there was the chance to validate them by submitting and checking the results to a data mining external tool. The data-mining module will probably be the most powerful tool available to the publisher, but the results are heavily dependent on the meaningfulness and effectiveness of the target questions and possible answers provided.

The full results of a game were properly formatted and injected in previously designed Rapid Miner (http://www.rapid-i.com/) processes (which are the ones to be implemented in the GDSS), so that clustering, classification and association rules algorithms could be run. In this particular contest, featuring two target questions and counting on with the participation of 524 users, some interesting results were attained. The most relevant association found indicates that more than 54% of the players who liked the Optimus Alive (a popular music festival in Portugal) page on Facebook usually listen to online music using Spotify (Table 1). The classifier (Decision Tree), in its turn, identified the age as being the most distinctive attribute, clearly stating that users with more than 51 years usually spend their day seated. The classifier also suggested that children below 12 years also usually spend their day seated (probably due to school activities).

Although the classifier did not present a good classification performance (mainly due to the small number of samples), it still provided valuable information, identifying the parameter that had a more direct influence on the users' response.

Table 1 Association rules results

Premises	Conclusion	Support	Confidence
Optimus Alive	*Spotify*	0.1945	0.538
Coldplay	*Spotify*	0.170	0.495
Muse	*Spotify*	0.183	0.469
The Simpsons	*Spotify*	0.178	0.455
5 para a meia noite	*Spotify*	0.198	0.454
5 para a meia noite	*Some physical activity*	0.178	0.408
Spotify	*Some physical activity*	0.165	0.413

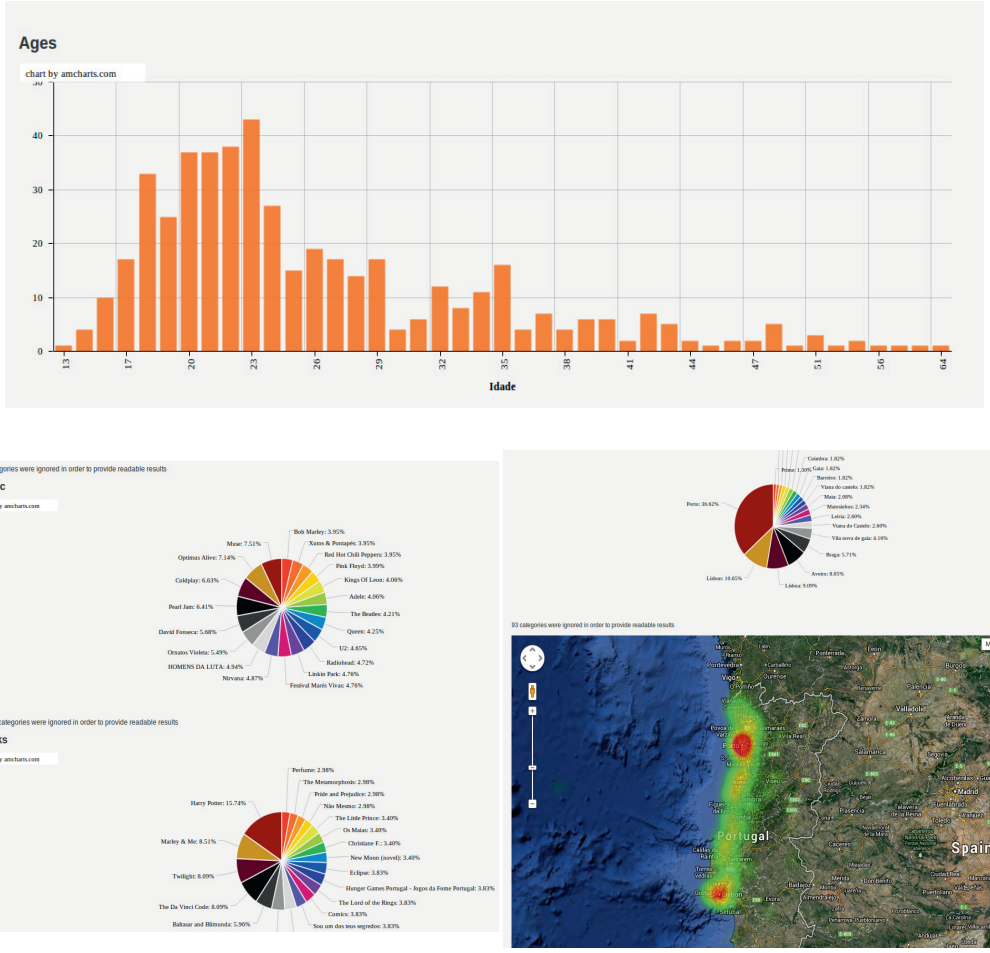

Figure 4 a,b) Statistics examples, featuring age, gender, interests (music, books, movies, TV, etc.) ; c) Players' location heatmap

5. Conclusions and future work

Based on the results and on the feedback from users and potential clients, it's clear that the outcome of this project will certainly be a major step ahead in digital marketing and is being seen as a powerful and effective marketing decision support tool. However, some issues around this concept are still to be addressed.

While in the work-in-progress status, this project still has some features to be implemented, like the support for other game types (crosswords, differences, memory), the full integration of the data mining process into the GDSS and finishing the web portals and the mobile containers. There is however some future work that is scheduled to the post-project phase. Namely, there are plans to reinforce the gamification process of the whole platform, so that players may be strongly engaged in checking the available games and play them. Also, there are plans to also reinforce the social interaction in the platform. Later on, the internationalization phase will take

place. More on a technical level, there will be a strong focus on improving the statistics and data mining results (user profiling) and move the social network analysis to a higher degree in order to start processing graphs and relationships.

6. Acknowledgements

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