A Social Interaction Taxonomy: Classifying User Interaction Tasks in Web Applications

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Abstract – **For social web applications, motivated users are an essential part. They create the new (Open) Content that is presented to users. Without ongoing current content such web applications are unviable. Creating and editing content means user interaction upon resources and with each other. It is no surprise that web applications evermore tend to use game design principles to keep their users motivated. In this contribution, a Social Interaction Taxonomy (SIT) is presented that classifies users for any kind of interaction within any kind of web application. For this purpose, we designed a taxonomy which classifies typical activities within web applications to prepare them for global rewarding with points and special awards in the next step. The focus of this contribution lies on the classification of user interoperation tasks in social web applications and the derivation of our taxonomy. It creates the basis for a Global Interaction Rewarding Model (GIAR) via RESTful web services. Web applications, that want to reward their users' activity with points, badges or other prizes in a global and application-independent way, can embed our taxonomy for activity logging with rewarding and the generation of activity stats known from game design (user rankings, level progression, etc.). By applying simple game principles like rewarding points and creating appealing, emotive user experience a "*boring*" vocabulary trainer becomes a vocabulary learning game. Students or other users of such rewarded interaction stay motivated. They easily walk through learning phases because they do not perceive it as learning, but as playing. Next to gaming mechanics, the developed Social Interaction Taxonomy can be embedded into, e.g., web activity monitoring systems to gain classified information about the users' behavior.**

Keywords – Game Design Mechanics; Interaction Taxonomy; User Interaction; Social Media, Web Applications.

I. INTRODUCTION

Since the first days of the World Wide Web, the Web design process is changing. Whereas the first available web sites presented static content to a user, nowadays users are able to interactively create new content. Web design has evolved into web application design, where the internet browser acts as the operating system and web sites act as applications, the user interacts with. As web sites become more and more interactive, principles and methodologies known from ID (interaction design) must be considered during the design process of a web application. One basic principle is that there is not "*the*" solution to a known interface design problem, there are always more solutions, and hence designing interfaces is always an iterative process of building prototypes and testing them with users to validate or dismiss a solution. In the past few years, a new trend can be observed in popular web applications like Twitter [1] or Flickr [2]: using game design principles to motivate respectively encourage users to keep being active within their applications.

The great benefit of games is, that people enjoy playing them (even for hours or days), because it is fun. It is something, they like to do since "*play is something one chooses to do*" [3]. More and more, web applications make use of simple game mechanics, like collecting points or providing leaderboards to "*put the fun in functional*" [4] and by this, keep their users motivated since they perceive the application as a game and have fun using it.

From this, it follows that designers of modern, interactive and engaging web sites must combine tenets from the mentioned disciplines: web design, interaction design and game design. Incorporating even simple game mechanics like rewarding points, leaderboards or level systems causes significant overhead during the design process of web applications. One has to choose, which interactions to reward, develop algorithms and models for leaderboards or level systems and compute activity stats to be presented to the user. The effort for data management rises as one has to manage the content that users create interactively, which is still the main purpose of web applications, and the data needed for applied game mechanics.

In some cases the effort of applying game principles does not pay off, e.g., for short-term online surveys where the main purpose is to aggregate data. But especially for such applications the quantity of data is important and this can only be accomplished by motivated participants. The quality of data is crucial for applications like the qKAI [5] mashup framework, which utilizes Open Content [6] [7] for interactive knowledge transfer and semantic resource annotation. Assessing certain criteria of information quality can hardly be managed automatically because they are of subjective nature, so it is up to motivated users to make statements about such criteria [8]. Utilizing game mechanics without the need to integrate them into an application can be achieved by using an independent global interaction rewarding service that deals with the whole "*game*" administration. One only needs to choose which interactions to reward and integrate corresponding service calls into the

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application to be developed. The service manages the interaction logging and rewarding, the evaluation of activity stats like leaderboards, level rankings and other kinds of information that have the ability to encourage people when presented to them. The rewarding service acts completely independent of a specific web application and by this can aggregate activities within different applications a user is active in. This can be used to derive some kind of a global WWW-activity ranking that reflects how active users are on the internet and may motivate them, to be more active in various web applications they have accounts in.

A. Our Contribution

This contribution is based on the master thesis of Nicole Ullmann [9] and her contribution to the qKAI mashup framework [5] [8]. In the following, we propose a Social Interaction Taxonomy (SIT) that classifies typical activities in (social) web applications by type and purpose. Based on this taxonomy we designed a generic rewarding system for user interoperation tasks in web applications that rewards interactions with points depending on the effort to execute them. Beside points users may win awards depending on the number of times, certain interactions have been executed. In addition, the rewarding system regularly determines the most active users within interaction-classes or interaction-skills to reward them with special awards. To overcome the mentioned need to integrate game mechanics into one's web application a RESTful web service [10] has been designed and implemented that enables any kind of application to reward users for being active by simply calling the rewarding service. The web service provides two types of service calls: calls for interaction logging respectively rewarding and calls for activity stats known from game design (leaderboards, level and skill-rankings, progression and gained awards). The focus here lies on game design mechanics and the derivation of the Social Interaction Taxonomy as basis for Global Interaction Rewarding (GIAR) discussed in further publications [9].

B. Structure of this contribution

In Section 2, we introduce some exemplary aspects regarding game design. In Section 3, we describe the derivation of our Social Interaction Taxonomy (SIT) and its interaction classification concept. This contribution ends up with conclusion and outlook in Section 4.

II. GAME DESIGN

Compared to the first existing computer games like Pong [11], nowadays developing (good) games is a complex process. It may take several years from the initial idea to the market-ready product and often involves staff playing different roles like producers, publishers and developers. Also the development process itself may be comprised of several stages like pre-production, production, milestones and post-production. It would go beyond the scope of this thesis to address the game development process in its entirety. So the main purpose of this section is, to give an insight into one sub task of game development: the game design. According to Wikipedia, game design is "*the process of designing the content and rules of a game in the pre-production stage and design of game play, environment and storyline during the production stage*" [12]. Thus, the first two stages of game development deal with game design whereas the milestone stage deals with the development of ascending game versions like alpha, beta and the final release version. The post-production stage deals with game maintenance after it has been released. Before we take a closer look at game design it must be mentioned that the mentioned game development process and its components is just a generic sketch of how to create games and can be found in (most) game developing companies. It varies from company to company and from game to game as it depends on the game type/structure/concept itself, the company's size and its experience with game development but the presented procedure is a good way to create games.

A. Basic Game Mechanics

Games use different mechanics to create an enjoyable game play. There is probably no complete list containing all possible mechanics, but the following five game mechanics, brought together by A. J. Kim [13], have showed up not only to be useful for games, but also for interaction designers creating social software and web services.

Points: Rewarding user interactions with points or the like is a pretty basic but yet a very effective mechanic that almost every computer game uses because they are easy to integrate and may serve as a basis for a lot of other mechanics. Points may be used to assemble leaderboards, which have a great motivational potential, as they tap into people's "*innate competitive drive*" [14]. Game designers need to be aware, that leader board mechanics encourage people to "*game the system*". This colloquially means that they learn how to achieve the highest rankings. Another application of points, are levels that map user's in-game progress or experience. For example, role-playing games use levels to unlock new powers or items. Beyond the game industry, points are often used to strengthen the customer loyalty by making them redeemable, e.g., like Payback [14] (Germany) does.

Collecting: Collecting is very popular, not just with computer games, people collect almost everything: shoes, baseball cards or stuffed animals. When it comes to computer games, people collect weapons, trophies or set items. Completing a set is a highly emotional moment, because it often takes a long time to find all set items and sometimes this never happens, which is frustrating to most players. Collecting mechanics generally have a great engaging factor, because people are happy about things they discover or gain. Especially, in applications or games with a social background, people love to brag about their collection.

Feedback: A. J. Kim's [14] definition of feedback as a game mechanic is quite the same as M. Prensky's [3]

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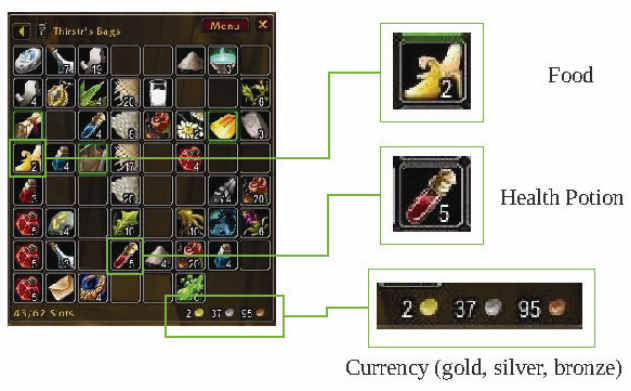

Figure 1. World of Warcraft inventory [21]

definition of feedback as a structural key element: feedback is the basis for player progression. If a game does not provide any feedback on interactions by a player, she does not know how these interactions take effect on her progression or the game play itself but beside this functional aspect of feedback, according to A. J. Kim, feedback makes games "*more fun & compelling*" [9].

Exchange: According to Amy Jo's definition, "*exchanges are structured social interactions*" [14], that can be explicit or implicit (in other words emergent). For example, most massively multiplayer online role-playing games provide options to trade items socially with other players and this trading interaction is explicit. A typical implicit interaction, mostly known from social browser games like Farmville [16], is called "*gifting*" which means that one can make others a present of items they have earned or found.

Customization: Almost every game offers the opportunity to customize it, be it the graphics resolution or the volume of sound effects. Beside this technical customization, players are able to change their in-game character's look, attributes and equipment. The customization may be performed automatically, e.g., by testing a graphics card's performance and an appropriate adjustment of the graphics resolution or by players themselves, e.g., by changing the color of a car in a car racing game.

B. Reward Types

Game designers greatly use their imagination, when it comes to the incorporation of engaging rewards as there are no limits to possible reward types. However, the following, incomplete list introduces typical rewards that can be found in some form or other in most modern computer games [17]. Skill Rewards are used to enable players to improve their in-game character's attributes and/or skills, e.g., increasing strength and vitality in Sacred 2 [18], or anything else that can be enhanced, e.g., technologies in Civilization [19]. Mostly, this is accomplished by rewarding skill points that players can freely distribute on different skills/attributes they possess.

Inherent Rewards are not directly given out by a game. It is the game's innards like graphics or sound that players enjoy, given that the game has a good design. Things like a thoughtful, exciting story or an imaginative, virtual world can be very rewarding and by this enhance the experience of a player.

Resource Rewards can be found in games, where resources play a role and this reward type can be easily included. Typical resource rewards are in-game currencies like gold or coins, resources that are "*essential for survival*" like food or health potions and other types of resources that are required by the game itself, e.g., armor and weapons. These resource rewards can be usually collected and stored in an inventory (see Figure 1).

Extension Rewards are given out if a game can end due to time-limitations or because characters die. The game rewards extra time or extra lives to extend the time a player can spend playing it. A widely known example of extension rewards are those green "*1-up mushrooms*" used in Super Mario Bros [20] to extend Mario's number of lives (see Figure 2).

Figure 2. Mario's 1-Up reward [20]

Accomplishment Rewards in general, are challenges, a player accomplishes in a game. Accomplishing typical tasks in games like leveling up, beating an enemy, answering questions or finishing quests can be rewarding if their degree of difficulty matches a player's progress, otherwise they are too hard or too easy to handle.

Motivational Rewards are simple things like points or trophies a player can earn respectively win, but they are not confined to virtual goods only. Also in-game characters encouraging one with words like "*well done*" or deeds may be very motivational to players.

III. SOCIAL INTERACTION TAXONOMY

In this section, we describe the derivation of the Social Interaction Taxonomy (SIT) and its interaction classification concept.

A. Interaction

Interaction must not only be seen as something that happens between a player and a computer, it has also a social aspect as a lot of games are played with other people. This of course holds true for almost all non-computer games, as the amount of games played solitarily, is small compared to

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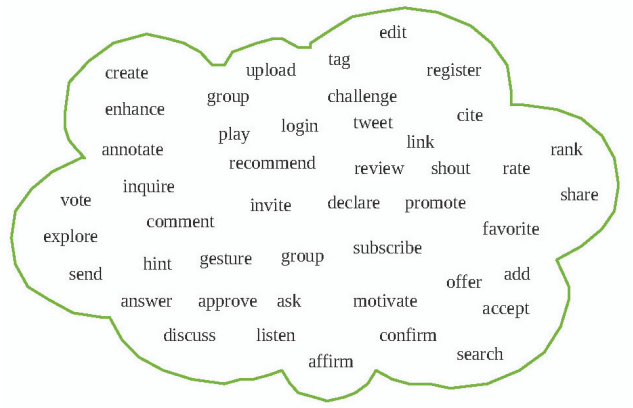

Figure 3. Social Interaction Cloud

games played with others. With the rising of the World Wide Web, designers of computer games more and more include social interactions into their games. There is a huge amount of multi mass online role playing (MMORG) games available and probably the most successful of them is World of Warcraft [21]. Critics stating, that playing computer games is an isolating activity, need to be aware of the fact that most computer games nowadays involve social interactions, although these social interactions are not face-to-face. However it must be brought into question, whether restricting social interactions solely on computer games, does not result in another form of social isolation, either.

B. Lessons Learned From Game Design

As seen in the Game Design area, user interaction can be classified. We extended this approach and developed a global Social Interaction Taxonomy for web applications – especially in the social media area. We overcome the in-game restricted rewarding models, choosing this overall generic and application-independent approach. The RESTful web service design allows embedding the Social Interaction Taxonomy in any web application.

C. Classifying Social Interaction Tasks

In order to create a global rewarding system, that rewards users for any kind of interaction, currently available activities in web applications need to be aggregated. Figure 3 illustrates this aggregation via a Social Interaction Cloud that makes no claims of being complete, because it is almost impossible to catch all interactions or rather their designation from every available web application. Nevertheless, the taxonomy that will be deduced in this section is generic enough to cover all possible (social) interactions and hence can serve as a basis for a global rewarding model. Certainly, (social) interactions can be classified in various ways, although we must state, that we did not find any available interaction taxonomy during research. The taxonomy we deduced, classifies interactions using two consecutive criteria that are based on two questions. The first question is: Who is involved in an interaction? As the overall aim is to design a rewarding model that rewards user interactions, every interaction involves a user. So the more precise question to ask is: With whom or what does a user interact? The last question reveals which possible counterparts an interaction in this taxonomy may have. It may either be a "*virtual*" object, like a video or a picture, which we will refer to as a resource, or it may be another user that in this sense constitutes a "*real*" object. Hence, the first criterion used to initially classify interactions is, whether it is a user resource or a user-user interaction. In the following, the first criterion will be stated more precisely by highlighting the properties of a resource respectively a user being part of an interaction.

Criterion 1

Criterion 1 classifies an interaction by its counterpart, which can be a resource, a user or both.

Resource: resources are things like videos, pictures or blog posts and in most cases they are directly accessible via an URI. Otherwise, they are indirectly accessible via the web application hosting the resource. Resources miss the characteristic of being "*active*". In an interaction, i.e. they are completely passive. Hence a user somehow interacts "*on*" and not "*with*" a resource.

User: although users can be seen as some type of resource, we make the distinction because users as opposed to resources have the characteristic of being "*active*" in an interaction. In the sense of the previous definition, a user interacts "*with*" a user and thus those interactions can be referred to as communication between users.

Both: in general, a taxonomy's purpose is not, to classify an object into exactly one category as they may belong to different ones, so for some interactions it is possible to classify them into both categories. For example, the grouping interaction may refer to group resources as it is possible within the social tagging system GroupMe! [22] or it may refer to group friends into self-defined friend-lists within Facebook [23]. The result of applying the first criterion on the given interaction cloud, is illustrated in Figure 4. It splits the cloud into two interaction-classes: the user-resource interaction-class with a resource as counterpart and the user-

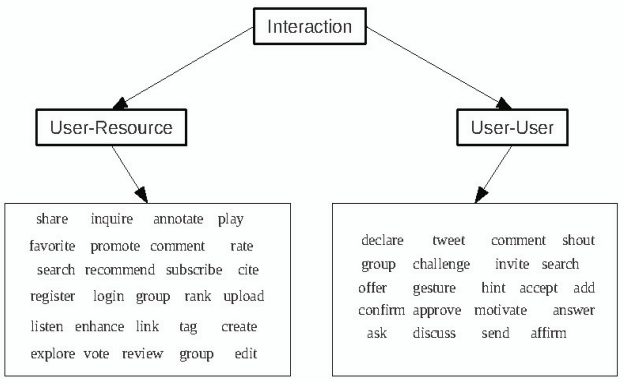

Figure 4. Interactions classified by its counterpart

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user interaction-class, where a user acts as a counterpart. As mentioned before, the classification of interactions is based on two (consecutive) questions and the second question is: How does a user interact with its counterpart? Both interaction classes answer this question from different angles and therefore use different criterions to assign their interactions to interaction-types. Interaction types belonging to the user-resource interaction class make a statement about what a user does with a resource. The following criterion (Criterion 2.1) gives an overview on interaction-types that we have deduced for this class and Figure 5 illustrates those interaction-types.

Criterion 2.1

Criterion 2.1 classifies user-resource interactions by what a user does with a resource.

Create: creating new resources means to make them directly or indirectly available via URIs. If a user uploads a picture to an online photo sharing community, the picture has been available before but not on the internet. As opposed to this, creating a new blog post "*really*" creates a new resource. Indirectly available refers to scenarios, where a resource is protected and can only be accessed after an authorization.

Edit: these interactions virtually "*happen*" around existing resources and do not necessarily result in a modification of a resource's contents, e.g., tagging a picture does not change it, but all these interactions are related to the edited resource.

Rate: every direct or indirect, positive or negative feedback on resources is covered by this interaction-type. For example, a book review is a direct rating whereas subscribing a GroupMe! group is an indirect rating.

Explore: this interaction-type covers all those interactions that do not fall into the previous types because, to put it crudely, nothing "*happens*" with a resource, it is neither created, edited nor rated - it is just explored. For example, if a user plays an online game, she explores but does not change it. The allocation of user-user interactions roughly follows communication science as it regards those interactions as a communication between users. These communicative interactions are distinguished into two communication types. This distinction is based on how intense a communication is. In an intensive communication, sender and receiver constantly or at least once change their parts. The intention of a sender is always any kind of reaction by the receiver and this is not always given in a less intensive communication, where a reaction by the receiver is not always expected or even wished-for. The intensity of a communicative interaction is the last criterion that maps user-user interactions into the following types. Figure 5 illustrates this classification.

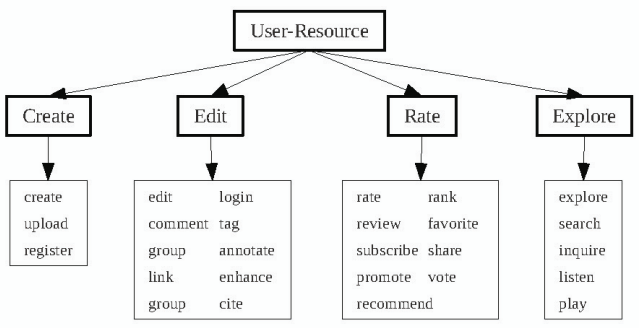

Figure 5. User-Resource interaction-types

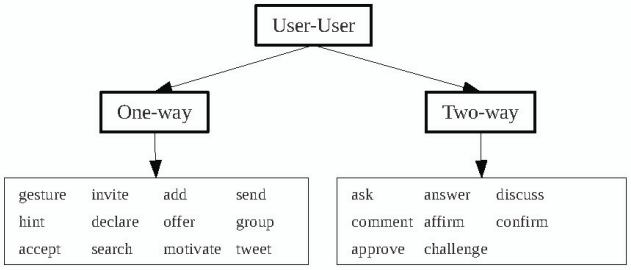

Figure 6. User-User interaction-types

Criterion 2.2

Criterion 2.2 allocates user-user interactions by their communicative intensity.

One-way: in a less intensive communication process, the sender is significantly more active, than the receiver and mostly does not get any response by the receiver. This is why, we refer to those interactions as being one-way, because there is either no reaction by the receiver required or the reaction is of no relevance for the sender that it is noteworthy.

Two-way: a two-way interaction, as its name implies, is an intensive communication as both, sender and receiver are active and constantly change their parts in a communication process. Even if sender and receiver only change parts once, for example in a scenario, where a user asks a question that is answered by another user, it is of high relevance for the sending user to get a response from at least one receiver. Putting together the mentioned criterions, finally results in a (social) interaction taxonomy as it is illustrated in Figure 7.

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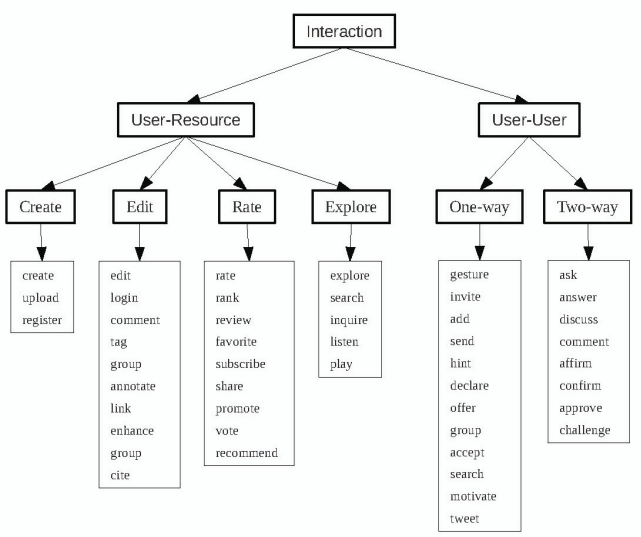

Figure 7. Social Interaction Taxonomy (SIT)

IV. CONCLUSION AND OUTLOOK

We presented a concept, to integrate an application-independent model for globally rewarding of user interaction tasks. The Social Interaction Taxonomy (SIT) can be integrated into web applications by RESTful web services. SIT serves as foundation for activity monitoring, interaction rewarding or analyzes. Increasing incentive and motivation to ongoing participation in social web applications are further use cases global interaction rewarding is very useful for. Basic game mechanics and reward types are presented and have been applied, in order to reward user interactions or to give feedback on their effect on users' progression. Our overall goal was, to create a global rewarding system acting independently from concrete (web) applications and especially from interactions, they offer. Therefore, we developed the Social Interaction Taxonomy. This taxonomy classifies interactions, at first by its counterpart which can be a resource or a user and then by the way a user interacts with a resource, respectively by the intensity a user socially interacts/communicates with another user. The taxonomy is ideal to classify and reward activity in learning contexts because it can turn any application into a game this way. SIT also allows tracking progress and users' activity upon web-based learning resources. An implemented application scenario relying on SIT will be exemplified at the conference.

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