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Abstract. Meta-design has emerged as a theoretical framework by supporting open systems that allow end-users to become designers in dynamic use contexts. Complex individual user goals which are embedded in social structures create these dynamics. Like many design theories, meta-design relies on pragmatic examples to extend and justify the theoretical foundations. Current examples of meta-design provide a basis for the theory by exemplifying core concepts, such as designing convivial tools, supporting human problem-domain interaction, creating open, evolvable system, and fostering collaborative work processes. Our research is grounded in the objectives that (1) the meta-design theory can inform the design of virtual worlds, and that, in return, (2) observations and insights from virtual worlds can broaden the meta-design theory. Based on interviews and ethnographic-style investigations of (1) a gaming-oriented virtual world and (2) an open-ended virtual world, we show that virtual worlds can serve as valuable application domain for studying, exemplifying, and extending the meta-design theory and practice.

Keywords: Meta-design, virtual worlds, design theory, end-user design, user-centered design, collaborative design, science of design, open evolvable systems, empowerment of the user

1 Introduction

In recent years, persistent virtual 3D-environments, in the following referred to as 'virtual worlds (VW)', have drawn increasing interest both from industry and academia [1,3,5]. VWs provide persistent virtual environments in which users can interact by controlling a virtual avatar. The avatar can move in the VW and interact with other avatars and virtual artifacts. Two of the most successful and widely used applications of VWs are:

- *massively-multiplayer online role-playing games* (MMORPGs), such as *'Lord of the Rings Online' (LOTRO)*, where millions of players worldwide come together and spend considerable amounts of time in order to engage in collaborative tasks or simply to engage in social interactions; and
- *open-ended VWs*, such as *Second Life*[1] and *OpenSimulator*[2], where users engage in many endeavors paralleling and augmenting daily life and work, including advanced, simulated environments that support various research efforts (e.g. Center for Computer Games & Virtual Worlds at UC Irvine[3]).

In this paper we re-examine and evolve the current theories of meta-design based on observations made within VWs. We present accounts of both a gaming-oriented and an open-ended VW system. We juxtapose our observations in the MMORPG *'Lord of the Rings Online' (LOTRO)* and the open-ended environment of *Second Life (SL)*. A series of interviews with individual players of LOTRO and users of SL provide individual viewpoints and contextualize the ethnographic investigation.

The paper is structured as follows. In the next Section we briefly introduce the concept of meta-design with a specific focus on systems and applications, as documented in the literature. The limitations of current system examples are shown and set in contrast to the qualities of VW systems. What follows is an introduction to the methodology applied in analyzing the distinct VWs. We then present our findings in both LOTRO and SL. Following that, the discussion leads to a synthesis of the findings which reflects on the duality between VWs and meta-design and a comparison of the meta-design properties of both environments. Finally, we reflect on the findings and formulate several future research directions.

2 Meta-Design Framework and Systems

Meta-design *"characterizes activities, processes, and objectives to create new media environments that allow users to act as designers and be creative."* [10] This rather broad characterization has been elaborated on in more recent work by Fischer and Giaccardi ([7], [8]). The emphasis lies on design processes that allow users to become co-designers of open systems. Meta-design concepts have found application in various domains. Costabile and colleagues further explored meta-design concepts in the domain of software development and end-user design [3,4]. Although these explorations and other domain-oriented systems are clearly worthwhile in helping to further develop the theoretical foundations. We find that the development and discussion of systems for actual meta-design practice has generally fallen short compared to the development of extensive theoretical foundations.

Initial theoretical foundations of meta-design have been established in the literature (e.g. [3,5]). Our research is grounded in the basic assumption, that in order to re-examine and evolve current theories of meta-design, the field would greatly benefit from suitable environments for studying user behavior in more detail.

VWs have the potential to shed light on one of the central aspects of meta-design:

[1] See: www.secondlife.com
[2] See: www.opensimulator.org
[3] See: http://cgvw.ics.uci.edu

the transition from unaware consumers to active contributors [5]. The user transition process is not static and does not apply to all users of an open system. Figure 1 shows a framework of end-user participation [6,18] in which users migrate from unaware consumers to actual meta-designers.

Figure 1: A Rich Ecology of Participation

The goal of meta-design is not to impose the binary choice on the user to stay a passive consumer or to become a designer. Users have the choice, depending on the context of interaction and personally meaningful activities, to be consumers in certain situations and designers in others. In the following section we briefly discuss meta-design environments in which users are part of a rich ecology of participation.

2.1 From Domain-Oriented to Open Systems

Design tools can be placed between the two separate dimensions of domain-specificity and openness [2,10] (see Figure 2). Domain-specific tools offer extensive support for context-specific problem areas whereas open systems are not specialized on a particular domain of application but offer a wider range of functionality. The desired functionality by the user of open systems might not be readily present from the beginning. More openness is often paid for by the complexity of system tailoring possibilities (see Section 4.2).

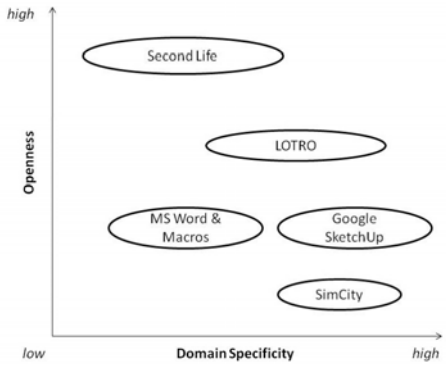

Figure 2: Meta-Design Systems

An example for a domain-oriented system that shows elements of meta-design is represented by Microsoft Office[4] Macros. Within the domain-oriented environment of Microsoft Office, users are provided with the ability to customize core aspects of the work environment and add additional functionality by writing Macro programs. Simulation games, such as Sim City[5], allow users to modify components of the simulation. Google SketchUp[6] and the related Google 3D Warehouse[7] allow users to create virtual 3D models in a community platform [18]. User contributions are shared with the larger, mostly domain-oriented community of users. Users of domain-oriented systems mostly focus on specific tasks are prepared to engage with the tools provided by the environment. While domain-oriented systems can serve as useful examples for discussing concepts and opportunities of meta-design for task-oriented user groups, they fall short in many aspects of providing examples for the transition of rich user ecologies in open system scenarios. The scope of task-specific, domain-oriented systems is often too narrow to accommodate a broad variety of user characteristics.

Most of the open systems and design environments discussed in relation to meta-design concepts are not open to a wide range of users. Individually, open systems might be framed by meta-design because they incorporate elements of end-user participation based on dynamic contexts.

2.2 The Potential of Virtual Worlds

VWs have gained in immense popularity over the past few years in academia [1]. The subscriber base of the most popular game-oriented VW ‘World of Warcraft’ has reached 12 million subscribers worldwide.[8]

[4] http://office.microsoft.com
[5] http://simcitysocieties.ea.com
[6] http://sketchup.google.com/
[7] http://sketchup.google.com/3dwarehouse/
[8] http://us.blizzard.com/en-us/company/press/pressreleases.html?101007

VWs let users create a virtual character which they can navigate in a computer-generated 3D environment using a software client application. Actions are initiated by users in front of the computer using the client software and performed through the virtual character in the VW. The user experience and feedback is channeled through the 3D representation of the client software.

For the purpose of the following discussion, we distinguish between two types of VWs which can be arranged on a spectrum between openness and domain (game) orientation. *Open-ended VWs* generally give users more creative freedom to create virtual artifacts and mostly define specific end-goals for its users. *Gaming-oriented VWs* mostly challenge its users with specifically defined goals in environments that are often of a competitive nature. The user's creativity with virtual artifacts is limited by the regulations of the game that are aimed at keeping the game experience fair and balanced for all users.

We have chosen both a game-oriented system and a more open-ended VW to investigate end-user participation. Both environments afford unique qualities that taken together can inform meta-design theory.

2.3 Virtual World Systems: Second Life and LOTRO

SL represents an open-ended VW system that allows users to modify and extend the virtual environment with high flexibility and in great detail. Users build up virtual artifacts from simple building blocks and can customize appearance and behavior of these objects. SL does not prescribe a common goal for its users. Instead users explore the possibilities of the environment on their own accord.

The game 'Lord of the Rings Online' (LOTRO) attracts users with a complex storyline and visually appealing graphics. Users of LOTRO can engage in various activities that ultimately lead to the development of virtual characters within the given regulations of the game framework. The creation of virtual artifacts in LOTRO is tied to the game logic and more constrained compared to open-ended VWs such as SL.

We see a dual relationship between VWs and concepts of meta-design that further motivates our argument to consider VWs for the extension of meta-design theory in general. In this discussion we specifically focus on user participation. Based on existing meta-design concepts, VWs can employ scaffolding processes that guide casual users. Similarly, the unique characteristics of popular VWs and the users they attract can inform the extension of user participation theory.

Figure 3: Second Life (left) and LOTRO (right)

VWs have great potential to affect meta-design theory by providing environments that enable casual users to, possibly unintentionally, engage in meta-design practice.

Our qualitative investigations of LOTRO and SL described in the following sections will show in much more detail how these VWs afford actives that can be framed by meta-design. The large number of casual users makes VWs particularly compelling field sites for exploring models of user participation in meta-design concepts.

3. Methodology

Our investigation of LOTRO and SL to re-examine and evolve the current theories of meta-design is focused on the following research objectives:

- develop *additional examples* of meta-design for worlds that have no laws and boundaries;
- support the *empowerment of end-users* that are not initially interested or motivated to conduct design practice;
- assess the *duality between VWs and meta-design*, i.e.: how does meta-design affects practices in VWs and vice versa; and,
- analyze the *support for meta-design* in both unique environments, focusing on the benefits and shortcomings of the gaming-oriented and the open-ended environment under study.

Our methodology draws from virtual ethnography [12,17] and from multi-sited ethnography [15], which allows us to supplement our findings with interviews with users outside of the VW context.

We conducted 80 hours of participant observation in LOTRO and SL. Additionally, we conducted 6 semi-structured interviews with players of LOTRO and two interviews with designers in SL. Each interview lasted between 40 and 60 minutes.

The ethnographic approach provided us with a qualitative lens to analyze the users' activities in both the gaming-oriented and the open-ended environment. Thick descriptions [11] of social processes were chosen to best capture the complex affordances of both distinct VW systems.

The authors played the game LOTRO and spent time in SL for more than 4 months. We took part in various everyday activities in both VWs with other users. Ultimately, we had the goal to understand the culture of the two VWs and to learn about user activities that are framed by concepts of meta-design with a specific focus on participation processes.

The long-term participant observation allowed us to learn about individual activities of the users in the VWs. The semi-structured interviews provided us with personal perspectives and reflections. We recruited informants for the interviews through snowball-sampling in the player community of LOTRO and SL. The interviews focused on themes of the VWs that we related to meta-design activities based on our previous participant observation. Additionally, we asked the participants about their individual personal backgrounds and their general motivations to participate in the VWs.

Patterns and themes based on our observations were analyzed using open-coding techniques [14]. We used our field notes of the qualitative observations in the VWs to contextualize the interview data. The data analysis focused on practices framed by meta-design in the VWs. We were specifically interested in the changing roles during different stages of participation. We structure our findings based on central concepts of meta-design originally formulated in [10].

4. Findings: Meta-Design Concepts in Second Life & LOTRO

LOTRO and SL share central characteristics of VWs. Both systems employ persistent 3D environments. Users interact in the VWs by controlling an avatar. A client software application on a local desktop computer serves to control the avatar. Users interact with other players and elements generated by the VW engine.

However, each environment provides a distinctively different user experience. In this section, we draw from ethnographic accounts and interviews [16] to analyze activities in LOTRO and SL. The presentation of findings is structured by the central concepts originally developed for meta-design [10]. Table 1 provides a comparison of the central meta-design concepts and the corresponding properties of the VW systems included in the analysis.

Meta-Design Concept	LOTRO	Second Life
convivial tools	Adventure & leveling system	prim design tools
domain orientation	goals from fixed set in the fantasy world context	user-imagined goals, open-endedness
open, evolvable systems	limited customization	unrestricted customization
underdesigned systems	fixed fantasy world context	minimalist environment

collaborative work practices	high cooperation amongst players	limited cooperation, specialization

Table 1: Meta-Design Concepts in Virtual Worlds

Both environments under study have their unique qualities that each individually contribute to the concepts of meta-design. Both systems have different approaches to let users participate in the creation of artifacts.

4.1 Convivial Tools

Convivial tools enable users to pursue personally meaningful activities with a purpose in the context that they find themselves acting in [13]. Users of both SL and LOTRO have very different personally motivated reasons to spend time in the VWs. Each environment affords different systems that let users pursue their personal goals. Here, we focus on overarching, convivial systems and not on specific tools. A detailed description of all tools available would exceed the space limitations of this paper.

Adventure & Leveling System in LOTRO. Many players of LOTRO are drawn into the game by the challenge it provides in the form of adventures, but also by the exploration of the fantasy world.

> *"It's exploration for me. New stuff comes out. This map is extensive that even people that have played it since its beginning – I can go to areas and they have never been there before." (user_1)*

This particular player, like many others we have encountered in the game, enjoyed exploring the fantasy-themed online world which provides new places to discover. The 'new stuff' is referring to expansions of the world released by the developers of the game.

The graphics quality and design of the environment stood out for the following player:

> *"For me it's the graphics, the scenery, all the different characters, everything just being in that Lord of the Rings universe. I guess I'm a visual person. That's really what draws me into it." (user_4)*

Adventurous activities, exploration of the VW and other activities in LOTRO create a coherent gaming experience and are linked by a sophisticated *leveling system.*

The overarching goal of players in LOTRO is to develop their online characters. Starting out with a novice character, the goal becomes to advance the character's skill sets and general combat strength. Successful performance in the VW grants players experience points which are accumulated until a threshold is reached and the character level is raised.

The leveling system affects most activities in the game. Players perform combat-oriented activities by solving quests and fighting other players or computer-generated enemies. Crafting represents one of the major non-combat activities and involves the creation of virtual artifacts, such as clothes, weapons and other supplies. Leveling up a character unlocks new skills and at the same time opens up new areas of the world

map to explore. Crafting powerful shields requires a high-level standing in the prospector profession.

The leveling system provides the structure for players to pursue various activities in the game and becomes a central concern for many as this sentiment shows:

> *"You have people that just don't really care. You have people running around with shabby armor. How do you get to level 50 with a level 30 weapon? [..] That stuff makes no sense to me. It takes from the game. I was able to have more fun when I had to work for it. Here, it is just given to you." (user_5)*

The leveling system becomes a public measure for the player's performances. Leveling provides a convivial system that provides the goal-directed structure for many actives in LOTRO. While the creation of digital artifacts is rather limited by the strict regulations imposed by the game's rules on the environment, the game achieves the participation by the users through a common, competitive goal system.

Prim-based Design in Second Life. In SL, users can create almost any virtual object by combining and shaping basic design elements called 'primitives' or 'prims'. Prims serve as simple building blocks for complex artifacts. The Lego system can serve as a fitting analogy. Construction can be performed directly in the VW using only the tools provided by the client software. To modify the looks of virtual artifacts, such as trees and buildings, textures can be applied to shaped primitives. Scripting languages can be used to automate the behavior of designed artifacts. Once placed in a public landscape, other users in the VW can see and explore the new additions to the environment.

SL does not provide a leveling system like LOTRO. Without a shared common goal for all users of SL, using the design tools to create personally meaningful virtual artifacts becomes the main purpose. The prim design tools represent convivial tools that allow for observing design practices of other players in detail.

> *"[…] I watched someone put together a truck. And he did amazing with that. […] Seeing the types of things he did actually helped when I wanted to go and make a little cart later. Being able to exactly see how he did it, made it much easier for me when I wanted to go do it."(user_7)*

Designing virtual artifacts becomes a shared experience and allows users to learn how to modify the environment from others. The design tool in the VW encourages learning by example without prescribing a shared goal. Participation becomes attractive through observation.

4.2 Domain Orientation

Domain orientation is directed at providing users with a collaborative environment that enables them to jointly share and create artifacts within a specific domain. A shared understanding of the domain creates opportunities to reflect on artifacts and share them with others. The VWs of LOTRO and SL employ very different concepts of domain orientation. LOTRO builds on a fixed set of pre-defined context that is tied to the story of the original novel. SL does not provide users with a commonly achievable goal. Instead, the users imagine most of the VW content and context.

Shared Task Concept of LOTRO. In LOTRO, players are immediately immersed in the fantasy world from the very beginning of the game. Once a new character has been created, players go through a scripted introductory adventure which introduces them to the main storyline. Taking on adventures and fighting evil forces creates a continuous cycle of goal-directed challenges that keep players motivated and united.

Players develop their own strategies to achieve shared goals:

> *"I actually quite enjoy questing. […] My characters have level 10 virtues because I spend a bit of time getting the deeds up. The first guy just went through and did everything. This guy, I've skipped a few of the harder quests that you had to do in fellowship rather than solo and when I got to a higher level went back to do the deed […] because I was able to do them a lot easier at a higher level."(user_2)*

This particular player developed a strategy to improve his characters. By postponing difficult quests early in the game and coming back to them at a later stage with a further developed character, he is better able to compete and succeed.

For players of LOTRO the domain of the *Lord of the Rings* universe creates an umbrella for activities within the fantasy environment. The purpose and value of most virtual artifacts (e.g. weapons, clothes and resources) is embedded into the theme of the game. This domain-orientation towards the original novel's universe of the game creates a natural understanding amongst the players of most virtual artifacts in the VW.

Open-Ended Context of Second Life. The model of SL prescribes no fixed user-achievable goals. Users individually imagine their personal goals in the open-ended VW.

The open-endedness is not something that suits every type of user as this user's reflection suggests:

> *"I went on the main Open Sim grid […] I looked around but the lack of directions, the lack of something specific to do kind of bored me. I'm one of the people who prefer to have something specific to do." (user_7)*

SL does not attract the same kind of casual user that is drawn to the gaming environment of LOTRO. The system does not take the user on an adventure. Instead, users are presented with an open environment that does only provide basic instructions how to move the avatar and use the interface in general.

As a result, the design of digital artifacts in SL can be very difficult for beginners when they are confronted with the complex design tools of the client software. Users share the same design tools in the VW but there is a higher barrier to entry. Unlike the apprentice approach in LOTRO where players would be guided through a leveling system, users of SL often develop different learning strategies:

> *"More and more it's self-education on an as needed basis. The process of learning these very complex systems it's tending more and more that way. […] There's a big community out there and when you get stuck there is some place you can go to find it or where you can ask." (user_8)*

The complexity of the design possibilities in the VW of SL causes this user to look for help in online discussion forums and in other (offline) places. The lack of domain-orientation in SL results in a fragmentation of the users' activities and goals. Every user-created artifact becomes unique. Freedom of choice is bought with complexity of

design. The complexity of design is not artificially imposed (e.g., by skill levels in LOTRO), but is represented by the actual design process.

4.3 Open, Evolvable & Underdesigned Systems

Open and evolvable systems aim at empowering end-users, to evolve existing systems to better suit their individual needs and problem contexts. The concept puts owners of problems in charge so that they can modify elements of the system if needed. Underdesigned systems create opportunities for users to adapt them to specific use contexts.

System Constraints in LOTRO. The VW of LOTRO largely represents a closed system. Most fixed elements of the VW, such as houses, cities and the general landscape, cannot be modified by the players. Players cannot add elements to public locations.

The crafting system lifts some of these restrictions. While the crafting system is still constrained to the use of recipes and thus does not allow for the creation of completely unique artifacts, certain customizations are possible. For instance, players can give a crafted artifact a custom label. In some cases, players can modify visual attributes of crafted items, but the range of artifacts that can be created is limited to recipes provided by the VW system.

We asked players how they feel about the constraints of the system. Most players did not feel that the game is missing an open system. One player told us:

> *"[…] maybe to make something personalized. It would be nice to have something truly identical but if I had to spend a lot of time to make that happen, I probably wouldn't do it." (user_1)*

This particular player is happy to customize elements but also objects the idea of investing too much time into creating something truly unique.

For this particular player, mastering and understanding the game mechanics becomes a goal rather than an obstacle.

> *"It [crafting] calms me down during the week. The fighting really hypes me up. All the yelling and screaming... I can't sleep. I craft during the week because it relaxes me and I am able to go to sleep when I'm done." (player_5)*

In this case, the constraints become a feature that provides a feeling of mastery and calming regularity.

Unrestricted and Minimalistic Environment of Second Life. The landscape in SL is kept very minimalistic compared to the detailed gaming environment of LOTRO. Users in SL mostly interact on simple island-shaped landscapes with very few graphical details.

On the contrary to LOTRO, SL relies on its user contributions to create artifacts for virtual environments. Users are given complex design tools (see previous section) to create almost any kind of virtual shape. However, this model has its problems, too:

> *"On of Second Life's biggest benefits is also one of its biggest downsides. I want to just make a mesh and import it and you can't do that. If you want something to look really interesting you have to build that completely, from*

top to bottom, out of primitives. Which is so unbelievably difficult when you are used to combining meshes with Boolean functions. It is a real pain." (user_7)

The problem is complexity. While SL represents the more open system it makes user participation difficult by adding a layer of complexity that can hinder users from actually becoming active contributors to the system.

4.4 Collaborative Work Processes

Creativity and participation is built on collaboration in groups of users and designers. LOTRO provides players with a sophisticated social framework. The environment is specifically designed for groups of players to interact with each other in many aspects of the game. SL users often specialize in certain aspects of the complex in-world design. Collaboration in SL is not specifically fostered.

High Cooperation in LOTRO. We found many examples for cooperative activity in LOTRO. Although it is possible to play alone and experience most of the game content without the help of other players, many functional systems are designed in ways that require players to work together. Examples for cooperation can be best exemplified by looking at crafting practices and the questing system.

The crafting system is interconnected and requires avatars with different professions to provide resources for one another. The questing system provides challenges that can only be accomplished in teams where the different character abilities complement each other to form a balanced and forceful unity.

In LOTRO cooperation in the crafting and the questing system is very common. What is more surprising is that the social community of LOTRO often creates opportunities for voluntary and unselfish cooperation. We observed that players of LOTRO frequently crafted items that did not directly contribute to their own skill set (i.e. completing the task was not required to progress to the next skill level). One player described the social motivation to do this kind of work in the following way:

"I guess there could be a sense of knowing that you created something that could help somebody elsewhere - it such goes the same for everything else in life." (player_3)

For this player, it is a personally rewarding experience to know that someone else might benefit from a crafted artifact.

We saw a similar kind of unselfish cooperation occur in the context of questing. Players use their social network in the game to seek for collaborators (e.g. friends and kinship members) or ask for help using public text chat channels. Experienced players often help in groups of lower-level characters. The helpful players often do not directly benefit from helping out but do support others in need. There is a different kind of reward that cannot be otherwise accomplished in the game: respect. Leveling a character provides a different kind of achievement.

Specialization in Second Life with Limited Cooperation. The convivial design tools in SL create an even ground for all users. A user experienced with modeling outside of SL reflects on this aspect:

> *"Because it's so hard for people who have experience modeling to go backwards it kind of gives the people who are learning to do it for the first time more of an even ground. Whereas if everyone could load in the mashes that he wanted and normal mapping, there would be a very small group of people who modeled most of the thing and everybody would have to buy it from them. But making it so that you really have to use that very simple technology kind of makes it fairer." (user_7)*

From this point of view it can be said that SL opens up design practice to every user by implementing a system that places casual users and experienced designers on the same level. Both user groups are required to learn the system-specific design tools.

Despite the even conditions, the complexity of the design tools leads to a specialization of users in specific design areas. For example, some users specialize in scripting objects, while others focus on aligning complex textures and shapes. The open system does not prescribe collaboration like in LOTRO. Collaboration does often occur outside of the VW, in external support forums where users seek for examples and advise from various special interest communities.

5. Discussion

SL and LOTRO represent two systems that implement elements of meta-design in quite different ways. Both systems can individually serve as systems for exemplifying various concepts of meta-design theory. A synthesis of the exemplified concepts allows for a more detailed analysis of VW system features that particularly affect casual end-user participation.

5.1 Gradually Empowering Casual End-Users to Collaborate

VWs, in particular MMORPGs, draw a large number of users. As our analysis has shown, users join the environments with very different aspirations. VWs can accommodate a very diverse user base by providing a system of technological and social structures that is sufficiently flexible to provide individuals with discrete virtual spaces within the larger system. Current systems discussed in the context of meta-design mostly lack opportunities to unpack rich ecologies of participation as shown in Figure 1. Our observations in the VWs point to a collaboration practices as deciding factors to support different levels of participation in the game- and open-ended context.

LOTRO makes casual gamers gradually aware of the functional and social properties of the game. The scaffolding system in LOTRO is based on elements in the VW providing guidance and works in close connection with collaboration between the players. While SL represents an open environment with great freedom of creative interaction, LOTRO's strength lies in the integration of collaborative community effects.

VWs offer an opportunity to study the effects of collaboration on the way casual users move through ecologies of participation. Technical scaffolding systems alone are not sufficient. Instead, social community components need to make collaboration tools more accessible and attractive for casual users.

Collaboration in VWs is closely tied to the social structure of the system. In LOTRO, collaboration is initially triggered by the functional structure of the game that creates the need for players to find collaborators for difficult adventures or to create powerful artifacts. Over time, the recurring need for collaborative activities creates social networks amongst players that, once initially established, are sustained for a longer time period. In this eco-system of social collaboration, the motivation to help others becomes detached from traditional reward systems. Respect and a good reputation become equally or more important than monetary rewards or other character improvements.

These examples show that a useful extension of the meta-design framework would be a careful analysis of user roles on an individual level. Intrinsic motivations to engage in creative activities only come forward in large scale systems such as LOTRO or SL.

5.2 Voluntary Design, Role Switching & Design Levels

Users of VWs can dynamically switch between the roles of passive consumers and active contributors. While the degree of contributions differs between LOTRO and SL, it is common in both worlds that users are not locked into either the designer or the user role.

The domain-oriented gaming environment creates opportunities for need-based attendance to creative practices. Players can also decide to completely neglect crafting activities. The open-ended environment of SL allows users to switch between observer and designer roles. However, the complexity imposed by the available design tools creates a higher entry barrier to become a designer. Meta-designers need to find a middle ground between complex and universal design tools as exemplified in SL and socially embedded creative activity as exemplified in LOTRO. Our results point to a priority for socio-technical contexts that allow users to develop their roles based on social interactions through collaborative activities with other users. More experienced users develop their own strategies while novice users require guidance to be gradually introduced to the system functionalities. There is not a perfect solution for this trade-off problem.

However, our analysis of two distinct VWs leads us to suggest an extension of the seeding, evolutionary growth and reseeding model (SER) [9] that clearly focuses on support during transition phases between different stages of participation. In the VWs other users constantly provide seeds for design practice. The leveling system in LOTRO gradually prepares players with coordinated stages and sub-goals on their progression from novice players to experienced performers. Combined with the visibility of fine-grained design processes observed in SL, our findings suggest a combination of these two concepts. Designers and design artifacts undergo stages of

evolutionary growth. Design products are re-introduced in the environments and serve users on different levels of participation as examples for novel design projects.

5.3 Duality between Virtual Worlds and Meta-Design Revisited

Meta-design theory can benefit designers of VWs. The meta-design concepts discussed in the qualitative investigation can guide game designers but also designers of open-ended systems. Possible design recommendations can be imagined by combining the social community elements found in LOTRO and the accessible design tools in SL. Studying VWs can contribute to broadening the theory of meta-design. VWs inherit qualities that can inform an expansion of the theory by providing additional systems to exemplify meta-design concepts. The large numbers of casual users with diverse interests in our view represent the missing masses that meta-designers should focus on. Gaming-oriented VWs employ concepts that gradually empower end-users while keeping them motivated and engaged. Social structures create an environment that fosters cooperation amongst the players.

Meta-designers look for tools to empower end-users to tailor systems towards their needs. Open-ended environments like SL provide these types of tools in virtual spaces. The tools do not discriminate between novice users and users with design experience in different domains. Studying tools that create an even, flat entry level for all users can inform concepts of meta-design tools in general.

Based on our study, we have identified a rich duality between VWs and meta-design. Meta-design potentially provides VW designers with a useful analytic design for user participation and open systems. VWs extend meta-design theory by providing a class of new systems to exemplify meta-design concepts.

Initially, it appears simple to dismiss LOTRO as a system for meta-design practices based on the regulations imposed on the users and the limited design opportunities in the VW. However, our analysis has brought to light concepts that meta-designers are well-advised to take into account.

6. Conclusion and Future Work

We investigated two distinctive virtual environments to explore the mutual dependency between meta-design theory and VWs. In our view, VWs provide many examples for meta-design theory. Exploring the central concepts of meta-design in the gaming-oriented VW of LOTRO and the open-ended system SL, has provided us with concrete examples of system specifics that each shed more light on the theory of meta-design.

The current study focused on two distinct VWs. While we found many features that inform our discussion VWs as systems for meta-design, our future research will include additional MMORPGS and other open-ended systems to further broadened our scope.

This work opens many avenues for future research. First, some open-ended VWs such as SL and, more particularly, the open source counterpart, OpenSim, provide

means for extension through source code modification. Extending them to provide scaffolding that makes meta-design more explicit in the VWs that players or end users experience is one real possibility. Second, the potential that meta-design holds for empowering end users is an on-going exploration. The implications in altering the power between the roles of end users and designers are just being understood.

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