Modonomics: Participation and competition in contention

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Abstract

This article considers user participation in 3D development practices, known as mod

development, in the commercial setting of the 3D software industry. By drawing on two

prominent developer firms, i.e. Valve Inc. and Linden Lab, this article is designed to

learn more about the increasing importance attributed to user participation in this context

by exploring the ways in which these software developer firms facilitate or invite users to

participate in development practices. The results of interviews conducted with employees

of these firms, and an online survey with their respective user base, are used as evidence.

The article demonstrates that, to various extents, interdependencies develop between the

firm, users and technologies, directing our attention to the boundaries of participation and

competition. It extends our understanding of how certain participatory designs provide a

structure to how game development is informed and organized across firm boundaries

based on the moderating role of product and user characteristics.

Introduction

With YouTube, Facebook and Twitter ranking among the world's most popular websites, we are witnessing actively involved users in firm-hosted platforms that tend to underpin some kind of novel configuration between (media) industries and consumers. While this blurring of production and consumption practices is not a new phenomenon, it has become 'increasingly clear that the Internet is not only embedded in people's lives but that with the rise of a more 'participative web' its impacts on all aspects of economic and social organization are expanding' (OECD 2007: 15), engaging firms to look at the consequences for commercial interests. Diverse lines of research ranging from media and communications, to business, to law, to economics have given attention to this 'participatory turn' reflected in the claimed democratization of World Wide Web technologies.

One stream of thought is preoccupied with reworking the organization of consumption by unlocking access to the organization of production or, in other words, activating and encapsulating the diversity of creativity in content consumption. Turning to the theoretical insights developing in work on user participation in media sites, which has been commonly referred to as 'participatory culture' (Jenkins 1992, 2006), users are well known to engage in the production of meaning, whether of cultural texts, corporate intentions or the technology itself (Burgess and Green 2009; Consalvo 2007; Livingstone 1991). These studies have tended to yield insight into aesthetic status and social power by casting the work of participating users as 'transgressive' (against the perceived economic interests of the producing/providing firm) or as at least, 'unintended' (not considered by the producing/providing firm but also not perceived as harmful). Such actions were thus seen as users taking firm-provided materials and to re-appropriate and redistribute them as cultural practices. The proliferation of domestic digital media technologies has facilitated the process, and there is a much broader application of such principles in practice.

Another stream of thought links these changes in technologies, economic organization and social practices of production to a knowledge-based view of the firm. In this view, the production of knowledge is understood as the key source for competitive advantage (Nonaka 1991; Teece 1998). The success of firms is reflected in their ability to learn along with the generation, exchange and utilization of new knowledge, competence and skills across firm boundaries, i.e. its user base (Huysman and de Wit 2002; Lave and Wenger 1991). Following this line of argument, consulting with users has become an important focal point for firms, highlighting the firm's innovation potential.

Consequently, firms appear to be actively encouraging and facilitating user participation in the development process, which may be evidenced in purposively designed and firm-provided tools and platforms (Von Hippel 2005). This is a means of systematically outsourcing certain design and innovation tasks from the firm to the users by presenting them with a broader palette to participate in advancing and developing products according to their own interests and needs. It is a relatively low-cost approach for firms to acquire user-provided information from which it can possibly benefit (Foray 2004; Thomke and Von Hippel 2002).

In sum, we can detect a series of foregrounding migrations between firms and users, drawing attention to the increasing complexity of the division of knowledge and labour in digital product development. Yet, little empirical research is available on the dynamics of how work is accomplished and organized across firm boundaries. This article, therefore, considers the trajectories of participation in the context of the 3D software industry, thereby highlighting the interdependencies developing between the firm, users and technologies, and the implications for the boundaries of participation and competition. For this purpose, this article draws on several prominent instances where 3D software developer firms facilitate or invite users to participate in development practices, i.e. Valve Inc. (e.g. *Half-Life*) and Linden Lab (e.g. *Second Life*). The results of interviews conducted with employees of these firms, and an online survey with their respective user base, are used as evidence to yield a more rounded understanding of mod development and its constituents and maintenance affecting game design.

The structure of this article is as follows: First, Valve Inc. and Linden Lab are introduced, accompanied by an overview of the methodology. This is followed by a discussion of

several elements involved in the organization of user participation in mod development practices on the firm-hosted platform. The third section explores the dynamics of mod development. The article concludes with a discussion of the findings demonstrating a co-evolution of participation and competition underpinning game design across firm boundaries.

Designing for mod development

Although there are earlier instances, game modification practices (modding) really took off in the mid- to late-1990s and have been mainly a PC-centred affair (Jeppesen 2004). In particular, First Person Shooter (FPS) modding has 'a strong history of fan involvement in modification' (Postigo 2008: 60). Also, it has been suggested that FPS mod culture has become 'institutionalized', and that the interest of both the developer firm and mod developers in technologically advancing FPS games 'may well contribute to the ongoing technological interplay between both parties' (Nieborg 2005: 3). Another, more recent and rapidly increasing PC-based mod format is associated with 3D collaborative developments, or massively multiplayer online role-playing games (MMORPGs), or virtual worlds, that appear to be less game-like, or not games at all. These kinds of virtual worlds seem to move away from more FPS game-like attributes towards a virtual environment where user experiences arise mostly from user-generated content rather than from the more structured experiences such as quests and tasks in a narrative form associated with many PC games.

In this context, this article draws on two prominent instances where game developer firms, Valve Inc. – well known for FPS games – and Linden Lab – known for its 3D

collaborative world – can be seen to have put forward a seemingly migratory and transient organization design within and across boundaries, inviting their user base to engage and participate in development practices guided by purposefully designed game technology.

Valve Inc.

Valve Inc., founded in 1996, is one of the most renowned and successful game developers worldwide. From its very beginning, Valve can be characterized by a mixture of maverick risk-taking and robust business planning. Common to many new game developers, Valve licensed the Quake engine to develop its FPS. Less straightforward was to hire employees directly from the Quake community. By tapping into the heart of the gaming community, Valve incorporated those gamers with the passion, skills and drive to make only the best of the best such as *Half-Life* (1998), which won more than 50 Game of the Year and a few 'Best Game Ever' awards. The franchise was expanded with a sequel and *Half-Life 2 Episodes 1* and *2*. Other titles include *Counter-Strike*, *Left 4 Dead*, *Team Fortress* and *Portal*. Thus, Valve is noted for its strong support of mod communities and for its interest in purchasing third-party mods for development into full games.

Valve also offers a social entertainment platform called Steam. It started out as 'a handy tool to update *Counter-Strike*' but has become the world's largest online and multi-lingual gaming platform (associated with digital rights management) offering instant access to 35 million users in 237 countries and encompasses over 1800 game titles. Steam facilitates and enables users to buy, play, share, modify and build communities around Valve products, community mods and titles developed elsewhere. In addition,

Valve is the owner of a state-of-the-art game engine, Source, which is available for licensing purposes.

Linden Lab

Linden Lab, founded in 1999, is the developer firm of *Second Life*. The format of this virtual world platform was set during a Linden Lab board meeting in 2001, when a number of people started building their own things such as snowmen on the 3D (empty) platform. Those inputs marked what was going to be the most compelling aspect of *Second Life*, having people build and contribute their own creations in real time. So, rather than forging an objective-driven and gaming orientation as is common in other gaming and 3D software contexts, Linden Lab shifted its goals towards an user-created and community-driven platform. Jim, a software engineer at Linden Lab, points out the importance of user participation, 'so from that point onwards, the whole of Linden Lab is very aware of the debt we owe to the people who are actually making stuff […] in what they know, and what they can contribute' (12 January 2007).

Since 2003, *Second Life* has hosted a collaborative, immersive and open-ended empty 3D environment that is being inhabited, designed and developed by its so-called 'residents' who own the intellectual property right over these contributions; it provides users with an interface with a built-in toolkit that can be used to build, script and texture the platform, and by accessing the source code the platform can be modded externally; it is also a highly sociable and communicative platform used internally by Linden Lab and externally to interact with the user base.

Data collection and analysis

For this article, a mixture of quantitative and qualitative data and methods were used to yield insight into the dynamics of user participation underlying game design. The research process was both deductive and inductive, starting with a more macro-quantitative analysis and moving to a more micro qualitative analysis and vice versa. An online survey was conducted among *Second Life* (N=434, 2007) and *Valve* game (N=136, 2007) users.[1] The surveys used the same measures but questions varied due to the nature of the different games and virtual world under investigation. The surveys asked respondents about general characteristics such as length and type of membership and about particular features and uses of the platform, that is, motivations, design (tools, features, usage), information and communication behaviour (e.g. information provision/seeker). Demographics such as gender, income and employment status were also collected. This technique was used to learn about user participation and interaction patterns involved in playing games and modding using, among others, descriptive and clustering methods.

The survey used open questions, checklist questions, ranking questions and five-point rating scales. It took about twenty minutes to answer. It used an unrestricted self-selected sample. The survey was announced on the *Second Life* and *Valve* forums. Users could therefore decide for themselves whether or not they wanted to participate in this study, which may have led to a bias towards respondents with particular characteristics. Therefore, I sought to make an informed decision about the results based on my own participation and experience with these games, and, where possible, comparison of the results to other available (survey) data sources so as to yield insight into the developer firms' approach to steer and facilitate user involvement in the game development process.

In order to obtain feedback on the accuracy and validity of the survey evidence and to gain a deeper understanding of meaningful themes, practices and relationships from the interviewees' own perspectives, semi-structured interviews were conducted with eight Linden Lab and thirteen Valve employees between 2006 and 2008.[2] Interviews were conducted face to face, in-world, via Skype, and phone, and transcribed. Interview transcriptions were coded, checked and rechecked throughout the coding process for consistency. Interviews lasted between two and three hours. The interviews highlighted aspects of their roles within the firm, interactions with users and their perceptions of learning opportunities. The interview data were used to 'tell the story' of game developers, highlighting the context of, and (latent) structures underlying, the explanations and interpretations of work involved in processes of game design within and across firm boundaries. Thus, it sought to yield insight into how the developers 'organize and forge connections between events and the sense they make of those connections' with other stakeholders (Bryman 2004: 412).

All the games that are fit to mod

Millions of people worldwide regularly play games, making the 3D software industry a social significant and high-risk, technologically advanced, capital-intensive, proprietary practice and billion dollar industry. Many contemporary 3D or game genres – but most prevalent for PC and in particular FPS (Nieborg 2005) – constitute a participatory design where users are increasingly approached as important components of development; 'rather than a linear, top-down process, ultimately what we find is a complex co-construction of technologies that occurs between designers, users, and the artifacts themselves' (Taylor 2006). Opening up (part of the) technologies is a prerequisite for the

developer firm to potentially benefit from user participation in development practices of both hardware and software.[3]

As a result, the development practice is repartitioned into sub-tasks between the firm and users, and which draws attention to modularity. A modular system can be understood as 'a nearly decomposable system that preserves the possibility of cooperation by adopting a common interface [platform or product architecture that enables] but also governs and disciplines, the communication among subsystems' (Langlois and Garzarelli 2006: 9). Modularity is often discussed in terms of the 'mirroring hypothesis', which poses whether product modularity is mirrored in the modular organization of the firm (Ernst 2005; Langlois 2003; cf. Nieborg and van der Graaf 2008).

From such a modular perspective, technology platforms associated with the game engine and toolkits are considered to be structuring or central components for which other stakeholders develop complementary technologies and products (cf. 'multi-sided market strategy' and 'platform leadership'; Evans et al. 2005; Gawer 2009). As a result, the platform tends to operate as a gatekeeper of information and value flows between different stakeholders from which they, and especially the developer firm, can possibly benefit (Ballon and Van Heesvelde 2011). Increasingly, with multiple stakeholders involved in development practices across firm boundaries, the boundaries of platforms are in constant flux (Parker and Van Alstyne 2008). Ambiguity, therefore, may arise about the nature of the firm but also about the main interface and (the nature of) the platform underpinning various competitive efforts that may not necessarily benefit or support the developer firm, and an unbundled and open market more generally (Ballon 2009).

Not much attention in this context has been given to the role of user participation on the firm-hosted platform, which seems to signal an uneasy relationship between productive engagement of users and the developer firm, and design and commercial interests, because users act as voluntary (and often freely) providers of knowledge and complements and provide value to the entire (and extended) platform. User participation typically arises from non-market and modular dynamics that are brought into a commercial setting that may yield substantial market value underpinning the 'growth of knowledge' across firm boundaries (cf. 'social network market' in Banks and Potts 2010). More specifically, user participation tends to operate in the complex borderland between modules and platforms where it seems that everybody (firms and users) can come up with ideas and these may be taken up and dispersed and retained by commerce rather than a linear or causal chain of production associated with a supply-driven approach.

In this line of argument, successful development across firm boundaries deals effectively with information costs, where the firm is seen as being interested in economizing on the acquisition of reliable need information that assists in delivering a product (or service) tailored to users' specific needs (while improving the knowledge base of the whole firm). Firms and users tend to know different things, finding expression in the development of different types of user contributions (e.g. innovations), thereby emphasizing that developer firms tend to focus on known needs and users seem to stress functionality (Von Hippel 1994). The stickiness of information, however, is not immutable. Stickiness can be reduced via investment to that end. In particular, new or improved products can be

developed without having to transfer sticky information from users if they fulfil particular design tasks.

Against this backdrop, rather than investigating the entire value chain of 3D software development (Jöckel et al. 2008), the next section aims to yield insight into the ways the developer firm seeks to facilitate user participation evidenced in purposively built systems that render modification activities of (parts of) existing platforms to users, or better, where users can get (partial) access to toolkits, engines and the interface that allows them to customize and design essential parts of the 3D environment and from which the developer firm can potentially benefit.[4]

Of toolkits, engines and interfaces

Toolkits are specialized software applications that are necessary for particular parts of the game development process, such as level editing and script compilation. They tend to lower the threshold by enabling and facilitating user participation in product development, supporting users to create products that correspond to their individual needs. Toolkits come in a variety of forms and allow users different modalities in design possibilities, ranging from having very simple scope (low-end) such as having the choice to select between various options like size and colour to granting users the opportunity to come up with new products (high-end) (Thomke and Von Hippel 2002). The more basic type of toolkit is typically used to exploit mature markets, while the more advanced kind tends to be used in the exploration of new opportunities for products and services. Furthermore, there are specific 'within-firm toolsets'. The firm equips its developers with tools they need in order to work. These tools may be internally designed but can also be third-party developed like commercial-off-the-shelf graphics packages such as Maya and

Photoshop. 'End-user toolkits' may be developed and provided by the developer firm. These toolkits appear to vary from being completely identical to the tools used internally to specifically designed end-user tools. They may also be third-party tools that come with the product or, if allowed and compatible, used on the mod developers' own account. And, if allowed and possible, users may develop their own mod tools. Both first- and third-party toolkits may be located internal and external to the 3D environment.

In general, tools appear to be custom-released by the developer firm for a specific environment, albeit those tools are frequently reused for other games (i.e. internally developed, licensed to third-party developers and mod communities). For example, game developer Valve has included its Source Development Kit (SDK) with first-party tools such as Faceposer, Valve Hammer editor, Model Viewer and third-party tool Softimage|XSI EXP, which was also used internally to develop the FPS *Half-Life 2*. In addition, for some tools (part of) the source code is also available such as for the Model Viewer, which enables users to mod the Viewer toolkit itself as well (Nieborg and van der Graaf 2008). Toolkits, however, may or may not be shipped along with the product, yet the release of them seems to be part of an industry-wide trend, coinciding with low-cost digital distribution platforms, of 'episodic games' such as *Half-Life 2* episodes, and 'expansion packs' such as *The Sims*. These practices contribute to shorten release cycles and lower prices, yet when accumulating costs of purchased content over time it appears to disfavour mod developers.

Not only toolkits facilitate mod development, but also the game engine can enable and support these practices. For FPS, the game engine typically consists of several components and includes a graphics rendering system, modules for artificial intelligence,

physics, scripting, networking and other features. The game engine is the developer

firm's intellectual property or proprietary technology.[5] The development of the game

engine is a very high-risk and costly affair, and therefore the engine often serves as a

development platform for multiple games. For example, Valve's Source engine is the

vanguard for the *Half-Life 2* series, the sequel *Team Fortress 2* and *Portal*. In addition,

game engines are frequently licensed to third-party developers. For example, the Unreal

Engine 3 was used by the US Army for *America's Army 3.0*. These practices are

facilitated by the engine's modular design, which allows other developers to, for

example, build engine plug-ins for offloading software routines. Not many developer

firms, however, open up their engine for development by end users, nor can the engine

technology itself be modded (this in contrast to third-party licensees and first-party

developers). For example, Valve prohibits mod developers to access the Source code for

the renderer, networking, physics and sound system. However, for the parts that are

unlocked, if compatible, third-party tool sets like graphic editors and first-party toolkits

may also be used. The game engine is thus neither 'infinitely adaptable' nor 'content

neutral' (Dovey and Kennedy 2006: 57).

For a virtual world like *Second Life*, the 'underlying technology' is arranged through a

client–server system architecture, constituting the so-called Viewer, or, client application,

enabling its users to access and interact with the 3D platform and others. The Viewer is

similar to a Web browser à la Firefox in that both are software applications that connect

to Web servers (the grid) and retrieve, or render, respectively, 3D content or web pages

on the user's screen. The platform is designed according to a topologically tiled grid. This

means that the 'four nearest neighbours' connected simulators look after the physics, run

scripts, manage the objects and the overall land within a fixed square region of space. So, when objects move around the physically simulated platform, their representation is transferred (along with, for e.g., scripts, objects and textures) from simulator to simulator when they cross over the 'boundaries'.

Second Life has also a built-in toolkit, that is, the 'browser' and 'tool' functionalities are integrated (cf. Forge of *Halo 3* for Xbox 360), allowing users to build, script and texture. For example, with a 3D modelling tool, users can develop buildings, vehicles, furniture and so forth, which can be used, exchanged or sold, and with the Linden Scripting Language (LSL) behaviour of in-world objects can be managed and controlled. Certain graphics, animations and sounds can also be externally created such as with third-party animation editors like Poser, and uploaded into *Second Life*. The underlying technologies used are a mixture of proprietary, free and open-source software, such as Apache (for the operating system) and Mono (a simulator upgrade). Since January 2007, (part of) the Viewer has also been open sourced under version 2 of the GNU General Public License with a FLOSS exception.[6] As a result, user-modded Viewers have been created and made available for everyone to use.

Against this backdrop, mod development underpinned by the qualities of the toolkit, engine and interface can be positioned within the established, capital-intensive boundaries of the proprietary technology of the developer firm (cf. Nieborg and van der Graaf 2008). This draws attention to the generative element associated with modularization and platformization, indicating that it increasingly seems less straightforward to contribute to modifying Internet-centred products and services in contrast to the firm and/or selected partners (Zittrain 2008). Yet, new or improved mods

occasionally pop up. Some are an instant hit and many may attract a small group of players. Who are these mod developers? What drives them? The next section yields some insights.

Modographics

Various studies have sought to examine user motivations underlying their participation in gaming and mod development, in particular. In the context of several MMORPG studies, gamers may be motivated by factors such as social interactions, escapism, learning and achievement (Yee 2006). Game modders seem to have a particular interest in enhancing or personalizing the game play, hacking, acquiring knowledge, creativity, collaboration and peer recognition (Behr 2007; Sotamaa 2004). What do the findings of the *Second Life* and Valve survey tell us?

The findings indicate that more men than women participated in *Second Life* (*N*=434, 58.8% vs 35.9%). The mean age of the respondents was 34.49 with a median age of 34 and a range from 13 to 68. By far, the largest groups of respondents resided in North America (58%) and Europe (32%). Nearly half of the respondents were said to work full time and about one-third of the respondents earned an annual income less than US$ 30,000. The appeal of *Second Life* was also measured in terms of social, topical and technical aspects, which are presented in Table 1.

Why does *Second Life* appeal to you?		Distribution in %
Relationships	I can enjoy social interactions with others	67

	I can help others with building, scripting and texturing	33
Escapism	I can pretend to be someone else	42
Creativity	I like to build, script and/or texture	79
	I can modify Second Life Open Source	13
Peer recognition	I can build a reputation	21
Innovation potential	It is innovative	87
	I like that we can retain intellectual property rights	56
	I can make money	46

Source: Survey on Second Life, *N*=434.

Table 1: Appeal of Second Life.

The findings for the Valve survey indicated that more men than women play Valve games (*N*=136, 95.6% vs 4.4%). Most respondents were derived from the age brackets 15 to 20 (33%) and 21 to 25 years (30%). By far, the largest groups of respondents resided in North America and Canada (48.5%) and the United Kingdom (18.4%). About one-third of the respondents consisted of non-working students and another third were employed full time, earning an annual income less than US$ 30,000. Also, Table 2 depicts the appeal of playing Valve games.

Why do Valve games appeal to you?		**Distribution in %**
Relationships	I can enjoy social interactions with others	47

	I can help others with modding	18
Escapism	I can explore different worlds	49
	I can pretend to be someone else	19
	I can reduce stress	67
Creativity	I like to mod	26
	I like themes and plots	77
	I like weapons	71
	I like great graphics	91
Peer recognition	I can build a reputation	43
	I can practice skills	31
	I can communicate with developers	38
Innovation potential	It is innovative	65
	I like Valve's SDK	31

Source: Survey on Valve games, *N*=136.

Table 2: Appeal of Valve Games.

It takes about four hours to familiarize oneself with the basic controls of one's *Second Life* avatar such as walking and flying, and much more for an advanced participatory experience as Warkirby, a user interviewed for this study, shared, 'I had a little experience with game mods before *Second Life*. […] I spent five months studying scripting on and off here' (3 Deacember 2007). With a user retention of roughly 10%, the majority of users do not get through this learning curve, but the ones that do tend to stay (cf. Yung 2011). In this context, the *Second Life* survey asked respondents about its attractiveness based on the main functionalities of the Viewer's built-in toolkit, enabling

and guiding users to engage in building, scripting and texturing practices in-world. The findings indicated that more than half of the respondents found the toolkit an appealing factor to participate in *Second Life* (M=1.74, SD=0.994, N=434). Moreover, about half of the user base has been reported to experiment with the built-in tools and to invest time to learn how to work with the toolkit.

Let us take a closer look at how the *Second Life* platform offers a space for development, or design, to occur. A built-in toolkit can be accessed in-world (on the Viewer task bar under 'Tools') and assists users to further develop the *Second Life* platform.[7] This toolkit enables users to build, texture and script (see earlier) for which its distribution is depicted in Table 3

Toolkit usage		Distribution in %
Building	I do it repeatedly	56
	I have before	20
	I would like to	13
	Not sure	7
	I would never do it	4
Texturing	I do it repeatedly	28
	I have before	30
	I would like to	20
	Not sure	14
	I would never do it	8
Scripting	I do it repeatedly	18
	I have before	17

|	
I would like to	27
Not sure	23
I would never do it	15

Source: Survey on Second Life, *N*=434.

Table 3: Distribution of toolkit usage.

The survey found that 56% of users frequently participate in building activities (*M*=1.82, SD=1.126, *N*=434). In-world generated builds can also be textured. Roughly one-third of the respondents were found to create and import textures (*M*=2.43, SD=1.244, *N*=434). Fewer than 20% of the respondents reported to actively participate in scripting activities, which is indicative of scripting being a more advanced practice, requiring different skills than for building and/or texturing practices (*M*=2.91, SD=1.325, *N*=434). The Viewer itself can also be modified. The findings suggest, however, that only a very small percentage of *Second Life* respondents modify the Viewer (on a need-base), while a large portion has no interest at all in those kinds of practices (*M*=1.88, SD=1.071, *N*=434). The Valve survey also asked respondents about their interest and participation in mod practices. About 55% of the respondents reported to install and play mods on a regular basis (*M*=1.65, SD=1.013, *N*=136) and 32% said to only do so occasionally. Furthermore, 24% of the respondents reported to make mods of Valve games (*M*=1.12, SD=1.006, *N*=136). Most make total conversions, followed by maps and some minor modifications like texturing.
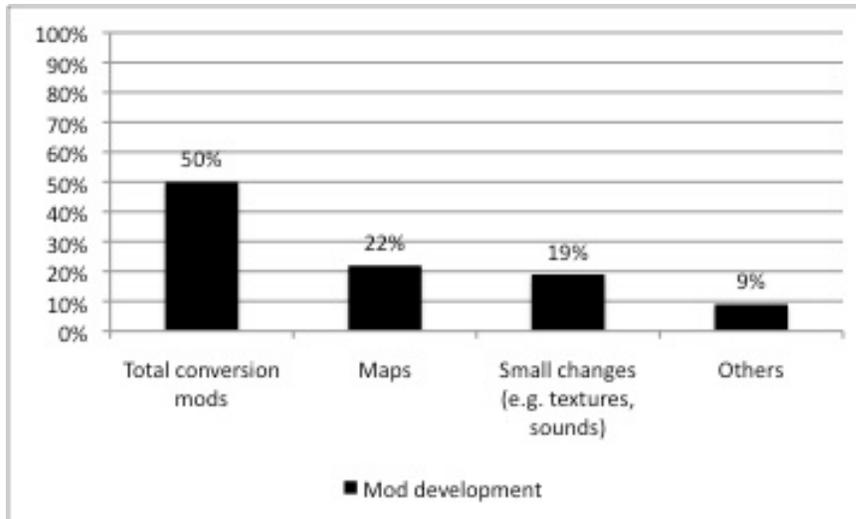
Source: Survey on Valve games, *N*=136.

Figure 1: Types of mod development.

For the respondents, reasons to mod included curiosity, boredom, interest in different and new experiences, enjoyment of coding and career opportunities. Reasons why respondents tend to shy away from modding included the level of complexity, lack of robust documentation, ideas and financial gain, and the difficulty to get a group of like-minded and skilled people together.

Professionalization and commercialization

In contemporary society, user participation in development practices seems to point to a kind of 'talent-led economy' where 'work' and 'play' appear to become increasingly blurred, suggesting that the organization of work cannot be understood separately from the domestic sphere concerning personal (and social) interests (cf. Kücklich 2005; Postigo 2007; Terranova 2000). For example, Lee (2007) has shown that 'creative workers' in London increasingly have a 'portfolio career' stressing a work-leisure flexibility underlying a perpetual entrepreneurial outlook to work where they 'commodify' themselves. Deuze et al. (2007: 350) have studied the working lives of

'gameworkers' and found that many make substantial sacrifices (particularly concerning working hours and copyright issues) to 'call themselves game developers'.

User development practices can be attractive sources for the developer firm to benefit from such as in terms of brand creation (e.g. purchasing and incorporating mods) and extension of shelf-life, increased loyalty, innovation and recruitment. Speaking from a knowledge-based view of the firm, the developer firm can be said to learn by expanding its overall knowledge base. Linden Lab has sought ways to, for example, harvest the full potential of user-based resources by putting various communication mechanisms such as wikis and specialist mailing lists in place, which inform and organize knowledge contributions associated with platform development. Strife is a well-known scripter and won the 2007 Linden Lab innovation award for Best Community Organizer

> I think my opinions are received well. I have influence as long as I don't overuse it. I've designed the spec for several LSL functions. I defined how all string and list functions should handle negative indexes and I wrote the test cases for llEscapeURL and llUnescapeURL. (3 December 2007)

Linden Lab can learn from such developments not only in terms of the actual solution, but also to inform the firm about what really frustrates users about scripting, what can be improved and possible means supporting this improvement. Linden interviewees regarded learning about what users are working on as a means to assist Linden Lab to strategize and prioritize work internally.

Valve is overall very supportive of mod developers and provides information and tools to assist such practices whether as a sole modder working from his basement or as a super-organized team.

We try to help as much as possible, like we have the developers' conference, we have the mailing list. If a modder sends me mail, I'll try to answer them. Like if you'll send me your code I'll build it and run it in our debugger and tell you exactly what you're doing wrong or what's going wrong, I've done that a bunch of time. (Robin, Valve, 24 August 2006)

Occasionally, unexpected things happen in the realm of Valve's SDK or logs that show up from the community. In particular, users employing Valve's technologies come up with creative workarounds, or use it in ways that Valve has not thought of or, for other reasons, chose not to pursue. Valve tends to be happy with innovative outcomes of which *Gary's Mod* is a good example. It actually extended sales for *Half Life 2*, because it was needed in order to run the mod. Perhaps unsurprisingly, new developers are often hired from the community. For example, John, mod developer of *Day of Defeat*, and now animator at Valve, recalls:

Valve contacted one of the other guys and so a couple of them came out here and then there was a business deal. It's like the dream in the back of your mind, you don't really expect for, especially someone like Valve, I mean a small studio maybe, but for Valve to come down and say, 'Go work for us, you make a game,' you know, that was just unbelievable. (24 August 2006)

The employment of users/developers seems to be an important strategy to incorporate intellectual property underscoring Valve's success with the incorporation of former mods such as *Counter-Strike*, *Team Fortress* and *Day of Defeat*. By tapping into the heart of the gaming community, developer firms appear to aim to incorporate those users/developers with the passion, skills and drive to make only the best of the best.

Linden Lab, for example, looks for people with the qualities Smart, Creative, Energetic and Passionate. The biggest challenge is spotting potential new hires that can work in an environment thriving on 'very smart and talented people that are self-directed and yet know how to work with others and juggle their expectations' (Yahn, Valve 24 August 2006). Mod developers can also be seen to attract hires for various paid and unpaid jobs, varying from employment arrangements of a more temporary nature to full-time positions, and tend to fish in the same pond as the developer firm. As a result, they compete with developer firms and many digital entrepreneurs in search of talented developers.

The quality of many mods, however, is often not optimal. It seems that, in many cases, mod developers seek to replicate success stories (think *Counter-Strike*). Some mods have such high quality that modders, perhaps unrealistically, believe that they have to compete with that. Subsequently, mod developers are increasingly working towards to becoming more like commercial products by developing more assets. However, the advantage of modding is that it offers a chance for users to do riskier designs than commercial products are able to do. In addition, they seem to hold a 'try and save up' policy by working on a mod for years, ship it and then expect it to be successful, whereas successful mods tend to get there by frequently releasing versions.

Good intentions and mechanisms aside, working with (and learning from) the user base is not an easy task. Linden Lab has, at times, been incapable of effectively dealing with user contributions especially due to a lack of internal human resources resulting in the company to be a 'bottleneck' and which may result in stagnating development and user

dissatisfaction and, arguably, increasingly motivate users to 'do it themselves' (van der Graaf 2009).

Both users and developer firms actively appropriate and rework digital resources, yet it is typically only the developer firm that can claim full rights and have contracts outlining what can and cannot be done. In the case of *Second Life*, the in-world development space is managed by a Terms of Service (ToS) agreement and the Viewer development space is bound by a GPLv2 with an additional FLOSS exception. In practice, there seems to be only a small difference between these two areas of development. Furthermore, mod developers of the Viewer, in contrast to commercial Viewer licensees, are not allowed to derive direct monetary value from their contributions. Therefore, these developments are, in principle, non-market productions and mainly depend on Linden Lab's proprietary code.

In general, it can be said that modders find themselves in the peculiar situation of being in the business of creating proprietary experiences (bound by the firm's software) that can be commercial and non-commercial proprietary extensions of the firm-developed product. For example, explicitly, users can develop digital developments that can be exchanged for money and a commercial license can be retrieved for business purposes, but, implicitly, a freely available mod may result in an overall better firm-developed product experience and direct more traffic towards the platform. Therefore, the pay-off for user participation in development practices seems to remain pretty marginal in terms of legal protection and opportunities for entrepreneurship.

Towards an inclusive understanding of participation and competition

The 3D software industry has often been considered as an exemplar for the organization of a modular design and market, highlighting the firm's overarching business model that can be characterized by a particular kind of outsourcing. In other words, there is a seeming interest in multi-sided platform business models that include also end users that develop for the platform, offering a greater potential for (market) growth by harnessing the (entrepreneurial) drive of mod developers to develop for existing or new product and platform (models) underpinning the enabling platform (a so-called 'modification effect market'). Contributing developers have this constellation space at their disposal to work in, negotiate with and reconfigure, drawing attention to the generative aspect of the platform.

The developer firm can thus (strategically) access the knowledge outside firm boundaries. Such a multi-sided platform approach highlights a more collaborative set-up on the one hand, while a more competitive one, on the other. The relationship between the organization of within-firm resources and external resources suggests the likelihood for multiple centres of development-related activity, competition and compensation to occur, where the developer firm and mod developers, throughout the course of development life, rub shoulders in different formations, moving attention away from the fluidity of firm boundaries to that of platform boundaries. Thus, such ambiguous boundaries (associated with, e.g., the reduction of (production) costs and non-linear expansion) seem to indicate a strong entrepreneurial approach towards the organization of work processes, which may not only benefit the firm, but also contribute to the users.

It draws attention to the co-evolution of participation and competition to occur. More specifically, it highlights opportunities for competition (and compensation) with the

developer firm, in particular, and the community at large. This may indicate a so-called 'participation tipping point' where the developer firm increasingly becomes a client of mod development (van der Graaf 2009). In this view, multiple formations constituted by commercial and non-commercial developers are role based and temporary because of the perpetual state of development characterizing the 3D platform. As a result, a dynamic relationship between designed and emergent practices is continuously shaped, negotiated, confirmed and reconfirmed among commercial and non-commercial contributing developers.

Conclusion

This study has focused on improving our understanding of the way interactions between the developer firm and users are developed and organized across permeable firm boundaries in the context of 3D product development. The results of this article suggest that knowledge-intensive and information-rich development practices are associated with certain participatory infrastructure and platform modalities highlighting learning relationships occurring between the firm and user base that underlie the business operations of the developer firm in informing and organizing product development. The findings have pointed to the significance of the blending of non-commercial development in game design. Yet, as development practices associated with fluid and ambiguous platform boundaries increasingly compete against each other, more research is needed to better understand what happens when users develop a competitive relationship with the developer firm. In addition, attention is needed from public and private policy in addressing competition, legal norms and policies underpinning information society phenomena. The issues described here require a deeper

understanding of the multifaceted interplay between platform competition, interoperability and the law as current multi-sided market business models seem to indicate that the converged modalities do not necessarily support to open and competitive markets. By yielding insight into the ways user participation is structured and organized across firm boundaries, however, these findings have, at minimum, provided a deeper understanding of the blending together of social dynamics and commerce as a significant aspect of the emerging knowledge-based economy.

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Notes

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[1] Note that a follow-up survey was distributed between December 2011 and February 2012 to those who participated in the previous survey. The data are currently being processed, and the results are therefore not included in the present study. For more

information, please contact the author.

[2] Note that follow-up interviews are planned in 2012.

[3] There exist many variants of 3D software modifications varying from world-building practices to partial conversions like gameplay mods (e.g. skins), to game-additions (or, 'add-ons') such as server tools or single-player missions, and to total conversion modifications.

[4] From this viewpoint, it is important to stress that mod development is not used in a technologically deterministic way where, for example, the toolkit or game engine impacts upon the developer firm and user base. Rather, mod development is investigated in reciprocal firm–user dynamics evolving in practice-based communities that appear to encapsulate users-as-developers in different stages of the product life cycle.

[5] Nowadays, game engines just like games have an ongoing development cycle involving constant updating.

[6] This is an additional clause granting its usage with several other free software packages.

[7] Note that in principle every user that joins *Second Life* has the capacity to participate in building, texturing and scripting the 3D environment, as it is not a prerequisite to own or rent land. In practice, however, having access to land is preferred for more dedicated (and permanent) development plans as land ownership permits all sorts of enhancements of the space and, if desired, other users can be invited to participate in

modifying land.