Technology, Agency and Community: The Case of Modding in World of Warcraft

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Abstract

In this paper, we consider whether and to what extent digital technologies enable people to accomplish expressive activities of personal or social value by examining customization and extension of software artifacts. We approach our topic within the context of multiplayer online games that provide a rather radical departure from the studies of organizational technologies that dominate the field. While less constrained by the rigid social order of organizations, the customization and extension of software artifacts in communities like those represented by multiplayer online games still confronts the central issue of the malleability of these artifacts and their power to shape human agency.

Introduction

This paper considers whether and to what extent digital technologies enable people to accomplish expressive activities of personal or social value. We explore these questions by examining customization and extension of software artifacts in the context of multiplayer online games. We connect a creative engagement with software artifacts with the potential emergence of new cultural meanings and means of satisfying desires for self-expression. Such an orientation obviously departs from the dominant tradition of mainstream information studies to which industrial informatics certainly belongs. Technology has traditionally been deployed as a productive force, first in industrial organizations and later in other sectors of modern societies. These conditions have historically established the dominant motif whereby technology has been conceived, designed and implemented as means to the accomplishment of pre-established ends. Despite the flaws and limitations of this project, technologies have firmly been inscribed within the stratified (power-based) social topology of organizations and the prevailing division of labor (Noble,1984; Perrow, 2002). Against this backdrop, it comes as no surprise that widely used organiza-

tional technologies such as workflow and enterprise resource planning systems (ERP) inhibit creativity and self-expression. Not only must rigid protocols be observed in order to interact with such systems, there is little possibility to customize and even less to extend them. Interaction is relegated to a narrow instrumental band of human activity that brackets or suspends the broad range of a person's "interests, values, feelings, and orientations underlying their personality" (Kallinikos, 2004b).

Despite a broad awareness of the social origins and purposes of technology as outlined above (see e.g. Zuboff 1988), the question concerning the ability of technology to shape human agency and organizational structures and processes represents a highly contested issue. Over the last two decades, it has been quite common to assume that far from being closed and pre-determined, technological systems are substantially renegotiated and reshaped in situ (e.g. Suchman, 1987/2007; Orlikowski, 2000, 2007). According to this view, the ways technologies are involved in particular settings are heavily contingent on the social practices and the organizational arrangements that prevail in these settings as well as the skills and proclivities of situated agents. Human interest, ingenuity, and creativity have thus been seen as indispensable components of the encounter of humans with artifacts of every kind. This work indicates that it is not possible to eliminate these human capabilities through deliberate technological design and prescriptive social orders. Concerns similar to those of our own have therefore been explored in the standard organizational settings by placing particular emphasis on the situated assemblage of factors and human attributes that transform and reshape, each time differently, the disembodied functionalities of technological systems or artifacts.

There is little doubt that such an understanding of technology has reinstated the significance of the social context that has historically tended to be ignored or seriously underestimated by rationalistic or engineering views on the matter. Yet, fruitful as it has been, such an understanding of technology nonetheless leaves a set of crucial questions in suspense, that is:

- To which degree do technological systems yield to the reshaping power of the social context into which they are embedded?

- Are technologies infinitely malleable?
- Are there any systematic differences between technologies or families of artifacts as concerns their degree of malleability that could thus be traced to the constitution of the technology as distinct from the social context? (Kallinikos, 2006).

Answering these questions, we suggest, makes necessary the persistent meditation on the nature of technology and the way it has historically been involved in the making and regulation of human affairs (Borgmann, 1984, 1999; Winner, 1986, 1993). Technology, we would like to claim, is a distinctive realm of the social. It represents a materially embodied form for accomplishing particular functions, expressing and mediating at the same time the social relations under which such an effort takes place. In this respect technology is surely socially constructed—yet under conditions of a skew social division of power, and differently distributed capacities, inclinations and skills. Particular technologies entail long developmental trajectories that reflect creative responses to solving problems that have been layered one upon another to form a complex and opaque regulative regime into which some social groups may have less freedom or power than others. “Artifacts have politics”, Winner (1986) has poignantly reminded us.

As suggested above, we would like to explore in this paper the degree to which humans are able to bend technological systems or use them in creative and expressive ways. But such a project cannot fruitfully be pursued by neglecting the ensemble of conditions or constraints established by technologies. It can only be accomplished, we contend, by thinking about, discovering or envisaging the space of choice and creativity left open or enabled by technologies and the distinctive forms by which they invite human participation. In the next section we provide an admittedly brief account of the framework of relations that render technology a regulative regime. Such a framework provides the background against which we subsequently explore the possibility of people engaging in creating encounters with software-based artifacts in a social context substantially different from that of formal organizations.

Technology as Regulative Regime

In outlining the bare bones of technology as regulative regime we draw on Luhmann (1993) and the way his work has been expanded by Kallinikos (2005, 2006). We suggest that modern technology could fruitfully be approached in terms of two strategies of acting upon the world, i.e., those of "functional simplification" and "closure." Both terms express the dual and omnipresent technological concern of a) deploying materials and durable artifacts for bringing effects on the world, b) regulating at the same time the forms by which people use or are about to use these material and artifacts.

Functional simplification represents the means by which the variability and multiplicity intrinsic to natural and social settings is reduced by selecting a narrower set of functions that are instrumented as strict causal couplings or chained procedural sequences. Software applications, for instance, are premised on the accomplishment of specific tasks. Microsoft Word can be used to write text but not to monitor logistic operations in a firm. This last task makes necessary other software applications exclusively devoted to it. Railways cannot be used by automobiles neither can highways be used by rail vehicles. While functional simplification underlies a variety of human activities with instrumental orientation it is the *sine qua non* of technology. It forms the prerequisite for constructing the chained and reified causal or procedural sequences intrinsic to technological operations and fully subordinating the instrumentation of means to a clear set of functionalities (objectives) which it helps to produce (Luhmann, 1993).

Functional simplification is then a strategy for reducing the complexity of the world by selecting a specific sets of tasks or functions to be accomplished and then engineering the processes by which these tasks are to be accomplished as effectively and smoothly as possible. It is worth stressing that functional simplification is not to be confounded with simplicity. It often results in the magnification of the force or power (productive capacity, calculative ability) by means of which tasks are accomplished. Indeed, among the principal reasons for using simplification as a technological strategy are the gains (or some gains) in performance or productivity or functionality. Highway systems, to refer to this example again, are highly complex and potent forms of increasing through-traffic. But they are just made for high speed driving—no stopping, biking, or walking.

The predictable order by which these causal couplings recur is guaranteed by closing off the technological system from external interference that may have disruptive effects on the recurrent nature of technology's operations. Functional closure is by and large accomplished by 'soft' techniques like prescriptions, skill and role profiles, input specifications and the like, but "harder" methods (blackboxes, fences, firewalls, protected zones and entries, regulated passageways) apply as well. In traditional industrial settings, closure is also aided by organizational techniques like stockpiling and forecasting that smooth out temporal or environmental fluctuation in input supply and product demand, leaving the operations of the technological system intact (Thompson, 1967). While functional closure is never complete, it does represent a meaningful strategy for controlling unexpected and unwanted interference on the operations of the technological system. Functional simplification and closure are analytical constructs that help disentangle the composite character of technology. In practice the two strategies coincide. Simplification is itself a form of closure which is further enhanced by the other social, organizational and technical forms of closure depicted above.

In other words, technological operations are wrapped up or closed off in a black box. The qualities of the black box are that it is impermeable, inflexible, and unviewable. As a strategy of regulation, blackboxing seeks to fix once-and-for all the premises upon which humans encounter or interact with technical artifacts. It produces one of the milestones of instrumental thinking and management which is the separation (to the highest possible degree) of the technical from the social system, and the strict regulation, as it were, of their interface. Whether Luhmann's characterization is generalizable to "modern technology" as a whole is debatable; blackboxing is certainly variable across contexts and technologies. However, it faithfully describes systems such as ERP or other large-scale technologies that are in use in corporations, governments, and organizations such as hospitals

and universities all over the world.[1] It may in addition provide a yardstick against which some of the questions raised in the introduction could be addressed.

Multiplayer Online Games: *World of Warcraft*

Now let us move to a very different place in the digital universe—the world's most popular multiplayer online game, *World of Warcraft*. This video game, produced by Blizzard Entertainment[2], is played by eleven million people. It is available in seven languages. The largest user population comprises Chinese players, followed by North Americans, Europeans, Koreans, Australians, New Zealanders, and Latin Americans. Monetarily, video games are good business. In the U.S., they have surpassed film in revenue, with multiplayer games accounting for about half the revenue (Kushner, 2005). Multiplayer games are enormously popular worldwide, in particular in Asia, home of the most avid gamers, with titles that sell in the millions (Whang and Chang, 2004).

The relevance of online video games stems from the fact that they allow for a more open relationship of people to technology. While sustained by a number of technological features or processes beyond the discretion of players, games of this sort do seem to represent a family of technological artifacts that try out alternative principles of human engagement with technology that, to a certain degree, modify or even break with the principles of functional simplification and closure. Through the use of player-created software modifications, or "mods," players customize and extend games with considerable freedom, engaging far more creativity and playfulness than is possible with fully blackboxed technologies. In other words, games do not simply enable people to use technology to accomplish whatever ends the game entails, but allow for intervening and modifying some of the ways this is done. In this respect, games of this sort are reflexive, allowing the experience of playing to feed back on the game itself and aspects of the software by which it is sustained.

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[1] At the university of the first author, rigid systems are a part of daily experience; they must be used for transactions with the library, the Institutional Review Board, the computer support organization, and other parts of the bureaucracy.

[2] Blizzard, headquartered in California, is the maker of a number of successful games. It is owned by Vivendi, a French media conglomerate.

The first author is conducting ongoing ethnographic research in *World of Warcraft*, a networked multiplayer game (Nardi and Harris, 2006; Nardi et al., 2007; Kow and Nardi 2009; Nardi 2010). In *World of Warcraft*, or "*WoW*," (as it is known), players create and control an animated character that moves through a 3D virtual world, meeting and playing with the characters of other players. Characters are based on a high fantasy motif derived from Tolkien's novels. Characters venture forth to slay dragons, amass treasure, practice medieval crafts such as alchemy, and generally leave the ordinary world far behind. These activities are conducted on servers that house about 20,000 players. At any time of the day or night one can log on and find others with whom to play or simply chat. Players typically join a "guild," a group of players with whom to socialize and collaborate. Many game activities require groups of 2-40 players.

The concept of play in *World of Warcraft* (and similar games) revolves around mini-games called "quests" in which players defeat monsters to attain rewards. The quest narrative may involve fetching documents, collecting a certain number of tokens, or battling a particularly strong monster. In completing quests, players accumulate equipment and other items to strengthen their character.

A WoW character A character's "backpack" with game items

What interests us about *World of Warcraft* is that it was designed *not* to be a black box. Players have the resources to make important changes—mods—to the game through an API.[3] Mods alter the game to suit players' preferences and to allow their ideas for game play to become part of game experience. *World of Warcraft* is one of many games that allow enough modding to significantly change the game experience (as opposed to setting a small number of preference variables). The most famous mod in game history evolved into Counterstrike, the best selling game of its genre. Originally a mod of the game Half-Life, Counterstrike, once commercialized, set expectations that game APIs would enable modding.[4]

In this paper, we would like to test the idea that mods go some distance toward allowing players' personalities to enter the game in ways that seem to differ from the functioning of systems such as ERP and workflow. Modding activity may also provide "adaptive potentiations," as Sutton-Smith (1975) called social experiments in play, experiments that may yield future rethinkings about technology.

The questions we pose engage philosophical issues including whether the freedoms of technologies such as mods go far enough to reframe some of the premises by which humans encounter technological artifacts, how far they should go, and how far they can go. Answering these questions may well presuppose addressing the cardinal issue of what defines a technology, what is essential versus secondary or peripheral characteristics of a particular technology. While we cannot definitively answer these questions, attention to the design and use of such technologies at least keeps the questions before us.

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[3] An application programming interface (API) is a source code interface that a computer system or program library provides to support requests for services to be made of it by a computer program . http://en.wikipedia.org/wiki/API

[4] The lineage of modding is unknown. Some trace it to performance tuning PCs (turning up clock speed and the like) while others extend it to the practices of automotive enthusiasts who rebuild vehicles in a variety of configurations such as "low riders" or "choppers." With artistic paint jobs, such vehicles are a minor art form.

Mods in World of Warcraft

Mods are created by players who enjoy playing *World of Warcraft* and have ideas for customizing play. Thousands of *WoW* mods are available for free download on the Internet (see Kow and Nardi 2009). Mods are maintained by their developers, requiring frequent updates as Blizzard periodically issues new patches to the game. There is generally no monetary reward for distributing mods although some sites ask for donations and some charge for premium versions of the software). If the cost of programming time were taken into account, *WoW* mods would represent a considerable investment.

The authors of a set of popular *World of Warcraft* mods wrote on their website:

> If you would be interested in working on some of the most used projects in World of Warcraft, please feel free to contact us...Unfortunately this isn't a “job” for us, it's what we do in our free time, so we aren't able to offer monetary compensation. Our primary goal is to get the sites to a self-sustaining state, where they pay for themselves, and don't require us to pull out the checkbook (ctmod.net)

Modders gain little in the way of reputation—they are anonymous to all but the most diehard players. Most players simply go to a website that collects mods and hit the download button.

Modding in *World of Warcraft* is limited. Players cannot change the game terrain, character appearance (outside limited customization when the character is first created), the behavior of the AI-driven non-player characters (NPCs), the particular “abilities” that each type of character has, or the quests that players complete to advance in the game.

However, the quality of play—the user experience—is vastly changed through the use of mods. Mods reduce effort, make visible invisible parts of the game, aid players in coordinating with one another, and capture important aspects of a player’s history of play.

WoW is a game of tens of thousands of little facts. Indeed part of the charm of the game is to be inculcated into a miniature culture in which one finds oneself earnestly chatting about where to locate materials for magical potions, the particular ways in which challenging monsters behave, or how to obtain enhancements to improve equipment. WoW is a game in which players accumulate small incremental changes to a character's abilities and equipment to play more effectively. Players constantly assess the "stats" or numerical values associated with their character and their equipment as well as the abilities of the monsters. During challenging encounters, players must track rapid state changes in multiple variables related to the characters and the monsters.[5] It is with knowledge of tiny but numerous facts about the game, the management of multiple character and equipment stats that improve in small increments, and attention to rapid state changes during battle that players improve play. Mods enhance these three functions.

Mods display information about facts and variables not visible in *WoW*'s standard user interface. One of the first mods many players download shows the coordinates of the game geography. Because the geography is huge, it is often difficult to know where to find a particular NPC or an item required to complete a quest. Coordinates by themselves would be meaningless, but as players discover new things in the game, they post coordinate information useful for particular quests on out-of-game websites and forums. Players regularly check these resources.

Mods help users keep their gear and materials organized, showing how many empty slots are available in the bags that contain a player's equipment, reagents, and other items, or how soon equipment will have to be repaired. Many players have different sets of equipment suitable for different activities in the game. There is a mod to switch sets with one key press. Another mod shows where a player has collected herbs and mineral ores, using a history of the player's actions to let the player know where to return in the future to find similar resources.

[5] In a "25-man raid," or large group encounter with 25 players and 5 or so monsters, each with multiple variables, this can mean assessing hundreds of variables.

Mods show the state of rapidly changing game variables, such as the duration of temporary magic spells or curses. One popular mod shows the characters that are the current target of a set of monsters in group play. Targets change quickly as encounters proceed. It is essential to track this information in the most difficult encounters in the game. Mods help players coordinate with other players by showing what a particular player is doing. For example, more than one player in a group may have the ability to resurrect a fallen player. A mod shows who is resurrecting whom—something difficult to discern in a large group. Mods can be used to send standard messages to a chat channel, enabling coordination by letting other players know the action a player is about to take or has just taken. Players who lead "raids," that is groups of 10-40 players, use mods to check that players are ready to proceed, to send messages about what is happening during a chaotic encounter, to display exact percentages of variables related to monsters (instead of *WoW*'s bar graphs). Mods can be used to trigger visual or auditory alarms—useful in fast paced group play.

Another function of mods is to enable players to redesign the user interface to express their personal preferences. Players demonstrate great creativity in developing a personal style; for example, some players make interfaces with the complexity of airplane cockpits while others choose a minimalist style with a few simple windows and buttons.

Mods provide an intimate quality to play. They reflect players' experiences in actually playing and enjoying the game. Mods enhance play, inserting good ideas into the game devised through players' own activity.

A considerable body of research has documented what would appear to be a similar creative use of technologies in local settings of a more traditional kind (e.g., Orlikowski, 2000). However, such creativity is often understood in essentially reactive terms; this stream of research is often predicated on an unspoken assumption of resistance that depicts human agents as seeking to *work around* software, rather than to work with it in harmony (see Kallinikos, 2004b). Such an assumption is problematic in various ways, the most important of which seems to us to be the exogenous (rather than mutually constitu-

tive) relationship between subjects and objects, human agents and technological artifacts on which it is tacitly based. Game mods present an alternative strategy to this understanding. Players interact with a software artifact that is largely well-designed, engaging and extending it in interesting and pleasurable ways. Technology and human agency mutually reinforce one another rather than working at cross purposes.

As players add mods, a feeling of empowerment grows, a sense of styling the game to personal tastes. For example, Zaq is a "rogue" (one of eight character types in World of Warcraft) conversing with another rogue, Jacquii, in guild chat[6] :

> **Zaq:** Jacquii, LazyRogue is a Mod i use. U can write ur own script to attack certain ways and react to certain situations. I use it because i find it fun to tweak my script and troubleshoot what doesnt work and what works for me. I dont have much script writing skills, so this is a fun way to learn something and understand how things work.

In ordinary life, Zaq is a bartender. He has no training in computer science but has learned to write simple scripts that he "tweaks" and "troubleshoots." He gains a sense of the possibilities of computational technology in an effortless way that he describes as "fun." He modifies his play experience according to his own personality, discovering how he likes to play his character through experiments with LazyRogue.

Mods are a social resource. Zaq shares his knowledge of LazyRogue with Jacquii. Players discuss mods in chat and share their opinions on mods they have tried. Players help each other find, configure, and debug mods. Mods are distributed by the player community in various ways. Guilds post lists of required or suggested mods for guild members and often include the download. Some players or groups of players create their own compilations of favorite mods as single downloads. Mods encourage collaboration, conversation,

[6] All player names given here are fictitious. Grammar, spelling, and punctuation are preserved in chat dialog. Chat was recorded using a function, /chatlog, that comes with World of Warcraft. Guild chat was recorded in one of the guilds in which the first author participates.

and the development of community through shared resources. In this second way, then, mods allow the personalities of players to enter the game.

Do player-produced modifications in *World of Warcraft* produce new cultural meanings or enable users to accomplish goals of personal value? The answer to the second, easier question is "yes." Whether players create or simply download mods, there is a strong sense of tailoring the game to a personal style of play, of "playing with the game." Mods, then, are a creative means by which to make a game fit players' interests, values, feelings, and orientations in pleasing ways. Mods go some distance toward allowing players' personalities to shape experience with a software artifact.

5. Discussion

We now return to the first question regarding the potential of play in *World of Warcraft* to enable people to generate new analyses and cultural meanings. Here we draw on the work of anthropologists Victor Turner (1982) and Stephen Miller (1973) and play theorist Brian Sutton-Smith (1975). They argued that play is an arena within which people experiment with new social forms. Sutton-Smith (1975) identified "adaptive potentiation" as an outcome of playful experiments with new ways of acting which may eventually penetrate the larger culture. Play "potentiates future developments" by providing a social space discontiguous from everyday life where people may experiment (Sutton-Smith, 1975). Art, sports, and games are venues of adaptive potentiation in the contemporary context, according to Turner (1982). While such potentiations may or may not make their way to other cultural arenas, they often do, such as the practice of delivering serious information via film and television — media once devoted primarily to entertainment.

Adaptive potentiation is possible because of the enjoyment people derive from playful experiments. Means are enjoyed for their own sake, they are not strictly subordinated to ends, temporarily having the quality of ends. We will employ some concepts from activity theory to examine this interplay of means and ends. In activity theory, ends are theorized as an *object*—the motivating objective of a human activity to which "the activity always answers," as Leontiev (1974) put it. *Actions* are undertaken to attain objects. The

horizon of possible actions is determined by an object (Leontiev, 1974; Kaptelinin and Nardi, 2006). In playful activity, the horizon of possible actions is large and never definitely closed off; people may even invent new actions to attain an object.

In modding, experiments with actions range far and wide; they respond to players' personalities and interests. Miller (1973) drew our attention to the importance of exploring and experimenting with actions in playful activity, suggesting that such explorations and experiments are defining characteristics of play. However, in games (an important category of play), means and ends do not simply dissolve into one another as Miller suggested; rather, it is the openness of actions (means) *in concert with* the meaningfulness of the game supplied by its motivating object, that players find compelling. Both actions and objects are of deep interest to players.[7] The coherence and unity of mutually reinforcing actions and objects give rise to the pleasures of game play.

Blackboxed technologies close the ways actions can be deployed in attaining objects. Such technologies are the antithesis of play; they attempt to eliminate possibilities for creative engagement with actions. In modding, art, and sports, people play with actions. Artists immerse themselves in experiments with technologies and techniques. Sportsman invent new equipment, athletes and coaches devise strategies, tactics, and maneuvers. The football huddle, where players hunker down to discuss means of defeating the opposing team, is iconic of the intensity and importance of game *actions.* Players are not creating a new game; they are deeply attentive to deciding the means by which they will attain victory (the object of the game) through intelligent and creative enactment of actions.

In work contexts with regulative technologies such as ERP, actions are controlled and restricted; they are merely necessary means to an end—not something with which to playfully engage. Those actions that are conceived as being supportive or aligned with technological design may well be refined and developed, but they represent just a limited

[7] Activity theory specifies that it is also possible for objects and actions to fully transform into one another. For example, we may speculate that CTMod developers are now more interested in developing mods than playing World of Warcraft. What may have started as an enhancement to game play has perhaps become the game.

set of actions. Technology is certainly a strategy of improving efficiency (the input/output ratio) but only against the background of established social relationships of inequality marking standard work settings. In this respect technology is a regulative regime, a mechanism of social control inscribing the contributions of people within a well-ordered and accountable universe. The pleasure of experimenting with actions is seriously truncated, suppressing employees' interests, values, and feelings. In the local adaptations of technologies studied by Orlikowski and others, we surmise that employees are try to break into play as they attempt to work around the limitations of the software systems they must use. However, ERP systems and the like allow little scope for such activity, limiting customization and extension (Kallinikos, 2004a).

Of course in the workplace, people are not playing games. But they could presumably engage with means in much more open and playful ways (see Nardi et al. 2009). Again work and play are tied to diametrically opposed social connotations that are ultimately rooted in strong ideologies and interests (Sennett, 2006).

Functional simplification tends toward restricting potentially disruptive experiments. What are the potential costs of such experiments? On December 6, 2006, Blizzard issued a patch that disabled many mods to which *World of Warcraft* players had become accustomed. This was not a glitch; Blizzard had deliberately changed the software so that many mods would not work. The patch was aimed at particular mods—primarily those that automated play through loops or conditionals. Blizzard felt these mods were changing the nature of the game by making it too easy. The company rendered inoperable some of the most popular mods that automated functions players considered tedious.

This occurrence indicates that *World of Warcraft* had not been designed wholly along the lines of functional simplification. The user community had disrupted the game with its mods according to the model of play Blizzard espouses. Something unexpected had happened; players were taking the game in a direction that apparently Blizzard had not foreseen. However, the software was easily brought back into alignment with Blizzard's desires. While the company undoubtedly devoted some resources to ensuring conformance

with company philosophy, the playful flexibility of modding continued and the system was not in jeopardy.

World of Warcraft is a large, complex, global game with millions of players. It easily rivals and exceeds ERP systems in size. The extensive modding *WoW* permits has apparently been managed successfully (see Kow and Nardi 2009). The risks of building systems with reduced functional simplification have perhaps been overstated for reasons that may ultimately be ideological; at the very least they should be reexamined. Playing with *actions*, not objects, is often the source of adaptive potentiations. Utilizing software artifacts that invite opportunities for playful experiments need not call into question the overarching objectives of corporations or organizations. The success of game mods indicates the possibility to design flexibly, without taking undue risks with organizational objectives.

Our investigation of *World of Warcraft* suggests that the conventional view of technology as "socially constructed" tends to obscure the reified materiality of the technology itself, its material resistance to or affordance of desired human activity. The local social order of players cannot be invoked to fully explain mods; *the software artifact itself* dictates whether it is "malleable" and to what extent. Assessment of the design of a technological artifact is essential; reportage of the nuanced details of user activity (usually fascinating no matter how small the local adaptations) may distract from the important task of critically examining the artifact itself.

As a strategy of design, functional simplification attempts to improve the input/output ratio and avoid the costs of disruption that may result from inappropriate actions or the interference of unwanted effects on core technological operations. But it fails to reckon other possible costs that may well in the end produce a different calculus of costs and benefits. Two among them are important to point out here. First, once installed, a functionally simplified and closed system undergoes a truncation of its capacity for adaptive potentiation. For adaptive potentiation may result, as we have seen, only from the opportunity to try out alternative constellations of actions or means for the accomplishment of

ends. The standard solution to this problem has been to reintroduce experimentation by institutionalizing the activity of technology (re)development and (re)design. Apart from the problems that separation of design from use is prone to engender, it is worth pointing out here, as Perrow (1984) has done on several occasions, that a closed off system of this sort cannot respond contingently, and this may often prove crucial for the successful operation of that system and the stakes invested in it. This leads to the second issue. Functionally simplified and closed off systems usually transport local risks at a more comprehensive level as their construction inevitably involves the trade-off of frequent, low impact (local) risks for infrequent, high impact risks. This is exemplified by accidents in highways (involving often dozens and in same cases hundreds of vehicles) and most dramatically by airplane crushes. Large integrated computer-based systems exhibit a similar problematic (Ciborra, 2000; Kallinikos 2005). While it may be that large scale, functionally-simplified and closed off systems are inevitable in the kind of society we live in, it does not follow that they are the only way to proceed.

The investigation of *World of Warcraft* provides some insights into another model upon which to base the technology/user relationship. In games, players write mods to bring important information to the surface, to automate repetitive tasks, to keep track of their activity to guide future activity, to tailor user interfaces to their own preferences, and to make interaction with software artifacts more pleasurable. Players document and distribute mods. Modding creates shared resources and the bonds of conversation and human interaction. This constellation of activities centered around a software artifact would likely increase efficiency and productivity in the workplace. Metrics cannot measure what is not taking place, so we do not know how much productivity and efficiency might increase if workers were engaging software artifacts in the playful, open, creative way gamers do. However, it is difficult to imagine such freedoms in traditional IT. In contrast to the rich assortment of mods in *World of Warcraft*, we compare the circumscribed options for customization in ERP (Kallinikos 2004a). Only a few options, such as choosing the number of modules to be installed, are possible. These options arise from within the frame of reference of the ERP system itself; they capture nothing of the personalities and desires of users. Modules are introduced periodically by developers or consultants rather

than those who use the software in their daily work lives. The black box of such systems abrogates the "tweaking and troubleshooting" characteristic of game mods, the creativity that might be engaged in imagining ways a system could be more useful or enjoyable.

6. Conclusion

The front page of the America's Army website invites players to create mods:

> [America's Army] allows you to submit missions created with the America's Army Mission Editor. Approved missions are made available on Army Official game servers!

While this enticement might seem a far cry from the reality of military service, we can envision ways in which such invitations create openings for adaptive potentiations that may, in time, alter existing practices.

It is too soon to tell whether the kinds of playful manipulations provided by game modding will assert pressure to make other software systems less rigid and closed, to encourage the black box to open a little. However, it seems possible that that this may happen. Corporations and government agencies are exploring virtual worlds such as *World of Warcraft* and *Second Life* for purposes other than entertainment. The U.S. military is putting significant resources into virtual worlds research.

Research is underway at Intel, Hewlett-Packard, Sun, IBM and other corporations on software architectures that provide gamelike 3D spaces with animated characters and a virtual universe in which to organize work objects and activities (Wynn et al. 2006; Nardi et al. 2009). The kind of creativity and productivity players exhibit has been noticed. Wynn, an IT manager at Intel, commented that for once corporations should be ahead of the consumer market in the way they manage IT, tapping into cultural currents such as game play (Wynn, personal communication). A number of companies and organizations have established a presence in *Second Life*, a 3D virtual world in which players build content through a scripting language. Second Life hosts applications such as a Reuters'

news bureau, customer sites for IBM, Toyota, and Sun Microsystems, many libraries, and a virtual office of the Swedish Embassy.

And, there is the legion of gamers themselves who have come to enjoy a degree of flexibility in their encounters with software artifacts. The majority are younger people whose expectations about software artifacts are shaped in part through game experience. These people will in turn shape future uses of software.

More playful engagement with software artifacts at work, in school, and in the military seems desirable, or at least a worthwhile experiment. While opening the black box entails the risks of disruptive effects on the recurrent nature of technology's operations, the risks of suppressing creative human engagement with technology must also be calculated.

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