

## Alone Together in Cyberworlds?

### Bridging Cyberworld Development and Design through MMOs

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**Abstract**—Cyberworlds fuel innovations in development and design, but whether and how to catalyze a slow-moving interplay among them remains an open question. This paper develops an argument for organizing interdisciplinary research through and around cyberworlds in order to bridge design and development by means of a collaboratory. To this end, it provides illustrative examples of plausible intersections between social sciences design agendas and broader cyberworld development agendas.

**Keywords**— *collaboratory; motivation; collaboration; education; videogames*

#### I. INTRODUCTION

The distinct work of design and of development generate complementary contributions towards cyberworld research agendas. And yet, while they may be opposite sides of the same coin, cutting edge insights in one typically emerge in isolation from the other. For this reason, we argue that innovative designers and developers too often inhabit cyberworlds alone together.

Consider, for example, efforts to establish presence in videogames. The feeling of “being there” often relies on powerful graphics rendering (development) and compelling game scenarios and narratives (design). Broadly speaking, design entails a generally additive process in this example. It focuses on connecting and expanding multiple techniques and strategies into a user experience. Development, on the other hand, entails a generally subtractive process. It focuses on unifying and consolidating elegant and stable architectures. With a view to massively multi-player online games (MMOs), both are obviously necessary and yet either

one, alone, is insufficient. If the development of powerful digital platforms and the design of captivating interactive processes remain inescapably interlinked, then how can/should innovators of design and of development come together? The interdependence of design and development imposes reciprocal obligations that limit how far one can go independent of the other. Can these collaborative processes be enhanced? Should interdisciplinary relations evolve?

The Cyberworlds conference primarily attends to the cutting edge of cyberworlds development. Looking back at previous Cyberworlds conference papers that focus on online games, virtual environments, and/or education and learning, we naturally find a strong emphasis on the presentation of technological tools and methods for improving cyberworlds, including virtual reality environments [1], storytelling technologies [2], and haptic interfaces [3]. Papers are geared toward addressing the potential or viability of these specific tools and methods in the developments. While design (i.e., human science) is sometimes mentioned or alluded to, there is a general lack of acknowledgement of the significant role design must play in order for cyberworld development to proceed effectively. As MMO researchers in the human sciences, we highlight dual innovations at work in cyberworlds in order to explore their potential for supporting interdisciplinary collaborations. Our aim is to consider whether or not developing cyberworld innovations and designing innovative cyberworlds can leverage this interdependence more productively. Recognizing that solid interdependencies already exist, we contend that they remain slow-moving examples of mutual assistance rather than generative collaboration. We therefore seek to identify and conceptualize metaphorical bridges between design and development of MMOs by sharing our vantage point.

## II. LOCATING CYBERWORLDS IN HUMAN SCIENCES AND VICE VERSA

Cyberworlds provide opportunities to explore and understand a range of phenomena related to the human sciences such as education and motivation. For the purposes of our argument, we focus on cyberworlds related to videogames where psychologists and sociologists consider phenomena operating in commercial videogames and where educational researchers are building and testing over 180 different cyberworld for learning [4]. In a similar vein, one-tenth of the work presented at the 2009 Cyberworld conference considers learning or directly related topics such as serious games. Recent estimates nevertheless suggest that these wide-ranging innovations and projects are still years away from impacting mainstream schooling [5], illustrating the slow-moving interplay between design and development.

As an exercise that justifies our arguments for building bridges, we consider our work in the social sciences in terms of several innovations reported at last year's Cyberworlds conference. We attempt to envision how the idea of digital immersion or embodiment intersects motivation and collaboration, on the one hand, and a range of cyberworlds innovations on the other. To begin, the 2009 Cyberworlds conference included papers addressing the simultaneous use of visual and haptic information to support collaboration around shared objects [6], virtual humans equipped with social intelligence, personality, emotions and user awareness properties [7], interactive and augmented mobile learning environments [8], and institutional-motivational evaluations of augmented reality games used in mobile learning [9]. Likewise, in our own work in Singapore, innovative cyberworlds enable us to explore relationships between established motivation concepts in sociology and psychology [10] and learning concepts in education [11]. Alone, each of these contributions to design or development is important and establishes solid linkages within, and sometimes across, disciplines. But together, they can inform research agendas in cyberworlds. We therefore ask: what benefit might a more coordinated and collaborative approach to developing and designing cyberworlds offer cyberworlds researchers across disciplines?

The challenge facing cyberworlds research may be no different than general work in science. Consider the approach to technology-enabled transdisciplinary research emphasized by the director of a major funding institution:

Our new vistas, our new ways of seeing, are provided by an array of new vision-enhancing tools. Among the most prominent are information technology and nanotechnology. In this dynamic vision, our tools are actually accelerating the merger of the disciplines. The entire enterprise must progress as a whole; gone are the days when a discipline could go it alone [12].

It is with this open question that we present an argument for developing and designing MMOs as an interdisciplinary

agenda that utilizes cyberworlds to build bridges between design and development.

## III. DESIGNING FOR EDUCATION THROUGH COLLABORATION

In the field of the learning sciences, collaborative learning is an intrinsically optimistic concept that encompasses a variety of strategies. While specific approaches remain quite diverse and continue to evolve as educators enlist new resources developed by engineers, computer scientists, and others, these approaches share common aims. At a basic level, all collaborative learning environments foster joint effort that builds shared knowledge among groups of learners. Many recreational gaming environments, MMOs in particular, design problem spaces that demand collaborative learning in order to succeed [13]. For example, players might assume different roles with mutually dependent duties or skills [14]. Conventional school activities, in contrast, provide information to individuals as an end in and of itself. Information is simply exchanged for a grade or credential via testing but never put to use. Meanwhile collaborative learning spaces more often revolve around action, execution, and a general process of participation. MMOs and other videogames position information as tools or resources that support a more primary emphasis on knowledgeable activity [15]. In this way, information is a means, not an end. These examples only highlight basic ways in which cyberworlds productively serve learning, but a wider array of possibilities need to be advanced in order to create more authentic, complex, and emergent forms of collaboration. Bridging development and design of cyberworlds one approach by which to collaboratively pursue mutually beneficial innovations. The remainder of this section therefore highlights two aspects of collaborative learning that lie at the intersection of development and design in educational MMOs—apprenticeships and social presence—and establishes links to recent research reported at Cyberworlds 2009.

Much like in a discipline or profession, there are multiple pathways for players to advance in MMOs. Discrete sets of choices or methods for completing tasks force decisions, generate consequences, and establish feedback cycles on multiple timescales that revolve around rule systems. The right or left tunnel might both be options for proceeding to a next village, for example, but proceeding is a rule – you must use a tunnel [16]. The team-oriented task structures within MMOs often encourage more senior players to seek out and nurture new players [17]. More often, the aggregate of choices expose each player to only some activities or experiences while closing off others. On one level, the arc of any player's decisions affords particular insights. On another level, the unique arc of different players' decisions provide the foundation for mutual exchanges of knowledge, skills, and strategies among peers. Both vertical, expert-novice apprenticeships and lateral, peer apprenticeships can be powerful forms of collaborative learning [18]. And yet, designing environments that give rise to apprenticeships remains a fundamental challenge for education MMOs

because it is difficult to balance the rules and the freedoms of collaborative interaction.

Consider, for example, one perspective on rules, scripts, and other activity structures: “a certain degree of coercion is required for efficiency reasons, but too much might be in contradiction with the very idea of collaborative learning and might decrease student motivation” [19]. The design issue is not simply one of engineering apprenticeships as forms of collaboration but also one of operating within the thresholds of what a student would find meaningful and motivating. The challenges of establishing clear principles are compounded by the diversity of environments and scenarios in which rules are to be engineered. Our point is that, while such challenges remain common, they can be more productively addressed together with developers. For example, visual and haptic information combined to support collaboration around shared objects [5] is one development agenda that can productively serve an MMO design agenda. We are not suggesting that simply combining development and design agendas will achieve magical results, though we do address several fundamental concerns below. We merely contend that these visual and haptic functions are a plausible example of the wider array of possibilities that can fuel a design-development synergy.

As a second example of these possibilities, social presence is also critical aspect of collaborative learning that presents fundamental challenges for any cyberworld. For example, merely suggesting that a virtual human is a real person has been shown to fundamentally change user experiences relative to a control group [20]. Education research suggests that promoting a perception of being among real, live people results in increased immersion and sustained interest and engagement. Insofar as social presence fosters productive learning environments, it is logical to consider cyberworld development agendas focused on virtual humans equipped with social intelligence, personality, emotions and user awareness properties [7]. Together with the illustrative example of visual and haptic tools for collaboration, virtual humans highlight possibilities for supporting collaborative learning and signal a topic of interest that is mutually productive for designers and developers.

#### IV. DESIGNING WITHIN THE THRESHOLDS OF MOTIVATION

Social-scientific research plays a key role in highlighting why and how people come to use cyberworlds, whether as “third spaces” [21], learning environments [4], or as work zones [22]. Psychologists typically argue that online behaviors are the consequences of individual’s personality types [23, 24], while sociologists and communication scholars posit that social behaviors are best understood within specific contexts. In this paper we emphasize the latter by suggesting that different users are motivated to come to cyberworlds for various reasons at specific moments in time and space. Motivation refers to being moved to do something, to be “energized or activated toward an end” [25], and is conceptualized along a continuum of relative autonomy from extrinsic to intrinsic [26]. Extrinsic

motivation leads individuals to engage in activities that are instrumental, i.e., that are means to other ends. Intrinsic motivation explains people’s actions in terms of the satisfaction and enjoyment derived from the activity itself, rather than from an external source. Consideration of peoples’ varying motivations for participating in cyberworlds is paramount for developers.

Regarding cyberworlds, researchers have previously found that extrinsic motivations include gaining rewards, such as money, fame, or power [27]. Psychologists have suggested that some online gamers play as a form of escapism from the pressures of daily life [28, 29]. Jeng and Teng [30] found that anxiety or neuroticism, as experienced in everyday life, was an extrinsic factor for spending more time in cyberworlds. Similarly, those with low self-esteem are more likely to seek external reinforcement of self-worth, which cyberworlds also provide through social networks and in-game rewards, for example. Among children, an individual’s perceived locus of control mediates the relationship between self-esteem and motivation to go online [31]. Those who see the “real world” as controlled by others may find cyberworlds to be less controlling spaces.

The often-perceived freedom of cyberworlds also facilitates the satisfaction of various intrinsic motivations, including feelings of competence, autonomy, and relatedness [25, 27, 32]. Autonomy is related to an internal locus of control, i.e., the perceived feeling of ownership of one’s life, a sense of achievement, mastery or self-efficacy, and a social sense of belonging with others. The relative perception of these factors influences other ways of experiencing intrinsic motivation. Lee [33] found that the flow experience, a state in which “people become absorbed in their activity, lose their self-consciousness, and are unable to recognize changes in their surroundings” is the most salient factor for people to adopt online technologies, including online games. A similar concept for intrinsic motivation is passion, characterized by involvement in an activity one invests time in and finds important and enjoyable [32, 34].

Most significant for designer and developers is the idea that motivations for cyberworld participation are complex phenomena. On the one hand, multiple motivations may co-exist and arise from personality characteristics, contextual factors, and personal interests and goals, among other factors. On the other hand, the same motivation component may represent intrinsic and extrinsic motivations simultaneously. In a factor analysis of survey data that measured people’s reported motivations for online gameplay, Yee [28] found that responses clustered around three dimensions: “achievement” (advancement, mechanics, competition), “social” (socializing, relationships, teamwork), and “immersion” (discovery, role-playing, customization, escapism). The subcomponents of each dimension cannot be explicitly categorized as either intrinsic or extrinsic motivation. Taking one example from each dimension: competition effects an individual’s self-efficacy (intrinsic) as well as her/his status (extrinsic); socializing provides the groundwork for creating a meaningful identity (intrinsic) as well as opportunities for reciprocity (extrinsic); and discovery satisfies intrinsic desires for exploration or

curiosity as well as providing opportunities to unlock secret knowledge which can be capitalized (extrinsic).

Understanding that cyberworlds are (a) designed in specific ways to structure users' actions/behaviors and (b) constituted through interactions among users and between users and design elements (e.g., completing quests, interacting with non-player-characters), practitioners need to create *social* environments that *immerse* users while rewarding their efforts by providing a sense of *achievement*. Individuals are most likely to regularly visit a cyberworld when they feel they are part of a larger social group, that they can contribute meaningfully within a social context, and that their efforts will be recognized. Different sources of motivation should come together synthetically in the cyberworld. An immersive environment ought to provide users with multiple avenues for interactive learning through developing communicative support networks, collaboratively building knowledge, and deploying that knowledge as domain-relevant expertise [35]. In short, a cyberworld with explicit means of achievement, being social, and immersing oneself should provide varying sources of extrinsic motivation for use, while satisfying intrinsic motivations for play as well. To what extent do development projects work with colleagues in the human sciences to build cyberworlds that players will be motivated to immerse themselves in?

## V. A WAY FORWARD: CYBERWORLD COLLABORATORIES

In this paper, we have considered MMOs as a dual innovation for cyberworld development and design. MMOs represent architectures of both digital interaction and social participation, providing illustrative examples related to the ideas of collaboration and motivation as they are addressed in the human sciences. We argue that more flexible and agile relations are not only desirable but achievable through the mobilization of an interdisciplinary research network founded on the principles of cyberworlds themselves. That is, the evolution of cyberworlds to date already manifests the progressive achievement of established, if not sometimes isolated, disciplinary rules, norms, and beliefs in computer engineering, mathematics, and other fields. At the same time, this ongoing evolution also represents a powerful resource for collaboration and social scholarship that can productively disrupt disciplinary boundaries in the service of innovation.

We propose leveraging cyberworlds themselves as shared laboratories with integrated, tool-oriented systems that support scientific collaboration. Such a strategy is often described as a collaboratory [36], of which there are wide ranging examples. One relevant model might be a distributed research center. Such a collaboratory brings together talent, resources, and effort around a unified topic of interest and joint projects [37]. Moreover, cyberworlds not only represent a topic of inquiry but constitute a site for inquiry as well, providing a synergistic foundation for the co-evolution of design and development.

Such a distributed research center organized around a cyberworld laboratory for design and development is not, in principle, a new concept. Importantly, the prospects of

moving beyond working alone together in cyberworlds rest on critical implications for scholars who bridge disciplinary boundaries. To be clear, while our arguments above demonstrate ways in which MMOs sit at the intersections of development and design in the context of research in the human sciences, interdisciplinary research involves both necessary and unintended obstacles. Any project entails engaging in negotiation, decision-making, and brainstorming, but these activities are difficult to examine through the lenses of multiple disciplines [37]. Therefore, it is critical to recognize that all disciplines maintain traditions of independence and face difficulties in communicating tacit knowledge. Meanwhile, formal organizations within a discipline often create (un)intended barriers to addressing either tensions. A collaboratory also creates its own challenges. In general, topics must provoke and sustain participation among diverse contributors. Project leaders must work to standardize protocols across locales and disciplines, and to organize and facilitate decision-making. In some instances, intellectual property and sharing agreements preclude open collaboration. The tradeoffs between individual and collaborative agendas must be addressed explicitly. In academia, project agendas must also anticipate career issues of younger participants for whom authorship may be critical. However, all of these tensions must be balanced against the growing potential, if not need, to increase the complexity and scale of disciplinary contributions, to establish new lines of research, or to commercialize innovations.

## VI. CONCLUSION

The ability to translate, to negotiate, to triangulate, and, at times, to simplify are the practices that create a flow between the additive and subtractive processes of design and development. This paper suggests several avenues of exploration around an MMO that can bridge these agendas productively. The opportunities and challenges associated with collaboratories remain open questions that depend on whether and how our work as social scientists connects to the broader agendas in cyberworld research.

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