Research Investigating Generation-Beyond-Next Computer Game Culture and Technology:

A Collaborative Research Partnership between the UCI Game Culture and Technology Laboratory and the Daegu Global R&D Collaboration Center

Final Report

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Introduction

The report documents progress and results obtained from our research study that is investigating generation-beyond-next computer game culture and technology during the period of 1 July 2009 through 31 December 2009. It also summarizes the overall set of results, findings, and lessons learned over the entire project period of 1 January 2007 through 31 December 2009. This study is in sup port of a collaborative research partnership between the UCI Game Culture and Technology Laboratory and the Daegu Global R&D Collaboration Center, in Daegu, Korea. The initial scope and research areas for study was agreed to by both partners in December 2006, and that served as the basis for effort initiated during this project reporting period.

Project Plans and Activities for end of 2009

Our activities in the past 6 months have focused on a number of topics described below. Each has been the subject of previous visits, email discussions, or presentations via teleconference with DIP since July 2009. These include research activities focused on ongoing efforts previously documented in our last progress report to DIP (submitted July 2009): (1) ongoing development and refinement of the WTF?! software development kit ("!"); (2) ongoing investigations into game modding and other methods for rapid development and refinement of games, game play mechanics and game play experiences; (3) ongoing investigation and refinement of open source concepts, tools, and techniques for developing online environments to facilitate collaboration and cooperative work among geographically dispersed teams; and (4) other topics that have emerged from our research effort to date.. Finally, there have also been research activities that focus on the development and refinement of new concepts and approaches for new R&D projects addressing emerging opportunities in computer game culture and technology. Activities in each of these six areas is briefly described below, and followed with a collection of reports

that help document what we have learned along the way, and that we can share with confidence.

WTF?! Software Development Kit (!SDK)

Our ongoing development and refinement of the WTF?! game engine and software development kit ("!") has been the project focus of Robert Nideffer and Alex Szeto. As of July 2009, we made a design choice to freeze development of the game, and to a lesser extent the game engine, in order to focus on a complete overhaul and ultimately new start development of the SDK developed using Adobe Flash ActionScript 3.0 programming/scripting language, which offers a non-upward compatible set of extensions and new implementations of Flash functionality that would best support the WTF?! 2.0. This turned out to be a painful and time-consuming technology migration but the effort invested in now bearing rewards regarding the WTF?! 2.0 SDK. Finally, as WTF?! was influenced by ongoing play experience with the *World of Warcraft* (WoW) MMORPG, then some effort was also devoted to better understand how user-created mods (or "add-ons") can be produced, as another basis for understanding how to incorporate similar capabilities in the WTF?! 2.0 SDK.

The first report provides presentation materials associated with this effort display the current "look and feel" of the !SDK, as well as help characterize how this SDK can be used to modify WTF style games and game based assets in order to create new games or game play experiences. A close review of these materials reveals a number of substantial refinements in the !SDK object editors have been made, along with the substantial source code modifications that were required to realize this improved functionality.

During Winter 2010, Professor Nideffer will teach a undergraduate course in modding and game development at UCI using the !SDK. The goal is to learn whether it is possible to produce 5-20

modded versions of the WTF game within a ten-week long course, using WTF 2.0 game engine and WTF game assets that have been previously developed by Nideffer and Szeto. The presentation materials for the !SDK and all other assets used to describe and specify the WTF game, are the same as have been presented in this report and earlier reports to DIP.

Game Modding Concepts and Techniques

In addition to the use of the WTF?! SDK for modding the WTF game, we are also more fully examining the range of activities and practices that are involved in game modding. This includes identifying how different kinds of socio-technical affordances serve to organize the actions of the people who develop and share their game mods. The affordances examined include customization and tailoring mechanisms, software and content copyright licenses, game software infrastructure and development tools, career contingencies and organizational practices of mod teams, and social worlds intersecting the mod scene. Numerous examples will be used to ground this review and highlight how such affordances can organize, facilitate or constrain what can be done. Overall, this study helps to provide a deeper understanding of how a web of associated affordances collectively serve to govern what mods get made, how modding practices emerge and flourish, and how modders and the game industry serve each others' interests, though not always in equivocal terms.

The report associated with this investigation has been invited for publication in the online journal, *First Monday* (http://www.firstmonday.org), and is scheduled for publication in a Special Issue on user created game content to appear in Spring 2010. This journal article has undergone independent peer review, so its publication signifies that this is a original and innovative research contribution. It is also considered the most comprehensive review of game mods, modding, modders, and mod scene yet to be published.

Open Source Software tools and techniques for dispersed teams of players/developers

Our ongoing investigation and refinement of open source concepts, tools, and techniques for developing online environments to facilitate collaboration and cooperative work among geographically dispersed teams has taken a turn for the better in this area. Our prior effort up through mid 2008 focused on the Virtual Collaboration Portal (VCP) whose development never quite reached a complete 1.0 release. Next, given our progress with the new version of VCP starting in late 2008, we began a new study to explore how such an environment might be integrated with an open-ended game or game-based virtual world. Our reason for this was to explore how and why people might want to bring together online game play/work with streaming media services, so as to be able to capture, store, retrieve, and view/engage streaming media content whether live online or played-back (and annotated) from archived recordings. Game mods documented as "machinima" video recordings is one such example.

Last, another study addresses how we can begin to better envision the capabilities needed to support distributed collaborative work (or play) within a dispersed team of participants. Emphasis here is on teasing out some concerns that distinguish teamwork when players are co-located and coordinated but not necessarily collaborative, and other teamwork/teamplay variations that are possible when new game based approaches, like those from the *FabLab* and *DinoQuest Online* games are considered. A fourth report in this section documents our knowledge gained to date.

The next report presents materials that document our results and knowledge gained to date, focusing on identifying issues to address when seeking to integrate VCP services within a VW using non-planar

"spherical visualization" methods. Our choice here was motivated in part through our ongoing collaboration with the Discovery Science Center in Santa Ana, and its recent acquisition and installation (November 2009) of a six-foot diameter spherical display system. Our interest has been to investigate how such a system can be: (a) used as a new kind of heterogeneous device for facilitating interaction in game-based virtual worlds for earth system science and space defense games (or military applications); (b) how to virtually reproduce the functionality of this system within a virtual world, so as to allow for much lower cost experimentation, use, and interaction with local/remote collaborators; (c) how to integrate remote network "spherecasting" data servers at the DSC with our local OpenSim virtual world servers so as to support multi-user remote control of distant spherical displays; and (d) how to integrate our streaming media servers with this system to record and document user experiences with the use of this system. Kari Nies, Craig Brown, and Yuzo Kanomata, three of our project's research programmers were responsible for the object modeling and system programming needed to integrate and demonstrate these capabilities.

Other topics in game culture and technology research and practice at UCI

Next, other topics that have emerged from our project effort since 1 July 2009. These include topics addressing: (a) new heterogeneous game play devices, specifically a physically drivable video arcade racing simulation game; (b) new techniques and tool for analyzing intellectual property rights and obligations that can arise when developing software for computer games, virtual worlds, collaboration environments, and other applications that are each subject to different software licenses (also know as copyrights or end-user license agreements); (c) review and update of our outlook on future opportunities for research and development in computer game-based virtual worlds, given recent market data that reveals the rapid growth and now domination of virtual worlds by users/players in the

5-15 year old demographic, in the U.S. and Europe (no data available for other non-English speaking global markets); and (d) recent developments at UCI building on the success of our research projects supported by DIP, the National Science Foundation, Intel Corporation, Discovery Science Center, and others that have led to the creation of a new research center focusing on Computer Games and Virtual Worlds, and the opening of the first of at least two new R&D laboratories that will support this center. Each of these new research topics is described and documented in turn.

Drivable video racing game simulator

One area of great interest to our effort in this project deals with how new kinds of heterogeneous game play devices may be developed or modded for use within a new generation of computer games or virtual worlds. Our most recent effort in this area considers the development process of a mixed reality video game prototype that combines a classic arcade driving game (a physical cabinet with a computer-based game embedded) with a real world vehicle that can be driven in an ordinary driving space. In this project led by Dr. Garnet Hertz in our project team, the user, or player, maneuvers the car-shaped arcade cabinet through actual physical space using a screen as a navigational guide which renders the real world in the style of an 8-bit video game. This case study is presented as a “perversive game”: an attempt to disrupt the everyday by highlighting and inverting conventional behavior through humor and paradox.

Techniques and tools for analyzing complex systems subject heterogeneous IP licenses

Another area of growing interest and importance surrounds the future of computer games and virtual worlds that are built using a mix of proprietary and open source software. Other the past three years in this project, we have developed or investigated computer games and related software systems and tools

that were subject to different "intellectual property" (IP) licenses. For example, the *FabLab* game mod employed the proprietary *Unreal Tournament* (Unreal2 and later Unreal 3) game engines and SDKs, but the UT license allows for the creation of game mods that can be distributed to others using an open source license. The *WTF?!* game and game engine were developed using commercially available tools for *Flash* from Adobe Systems, while with the development of the *CBA* game, we utilized the commercial *GameMaker* SDK. Our development of virtual worlds has employed the *OpenSim* server and *Hippo* client browser software, both of which are licensed with unrestrictive BSD open source software licenses, rather than the proprietary licensed *Second Life* server and client whose functionality they replicate. Finally, to help make clear the growing awareness of games and game development software being subject to multiple, heterogeneous software licenses, we show the current set of IP licenses that apply to the very popular *Unity3D* game SDK.

1. The Mono Class Library, Copyright 2005-2008 Novell, Inc.
2. The Mono Runtime Libraries, Copyright 2005-2008 Novell, Inc.
3. Boo, Copyright 2003-2008 Rodrigo B. Oliveira
4. UnityScript, Copyright 2005-2008 Rodrigo B. Oliveira
5. OpenAL cross platform audio library, Copyright 1999-2006 by authors.
6. PhysX physics library. Copyright 2003-2008 by Ageia Technologies, Inc.
7. libvorbis. Copyright (c) 2002-2007 Xiph.org Foundation
8. libtheora. Copyright (c) 2002-2007 Xiph.org Foundation
9. zlib general purpose compression library. Copyright (c) 1995-2005 Jean-loup Gailly and Mark Adler
10. libpng PNG reference library
11. jpeglib JPEG library. Copyright (C) 1991-1998, Thomas G. Lane.
12. Twilight Prophecy SDK, a multi-platform development system for virtual reality and multimedia. Copyright 1997-2003 Twilight 3D Finland Oy Ltd
13. dynamic bitset, Copyright Chuck Allison and Jeremy Siek 2001-2002.
14. The Mono C# Compiler and Tools, Copyright 2005-2008 Novell, Inc.
15. libcurl. Copyright (c) 1996-2008, Daniel Stenberg <daniel@haxx.se>.
16. PostgreSQL Database Management System
17. FreeType. Copyright (c) 2007 The FreeType Project (www.freetype.org).
18. NVIDIA Cg. Copyright (c) 2002-2008 NVIDIA Corp.

Licenses restricting the Unity3D SDK

Unity3D is a very popular and low-cost game SDK which can help developers produce run-time

versions of their games on different computer platforms, from PC to Nintendo Wii, Web browser, and iPhone. Thus, it appears that it popularity and low-cost may stem in part from its use of externally developed, open source and proprietary software components that are subject to different licenses.

Accordingly, we engaged an in-depth study for how to analyze and understand these licenses, and to determine how best to create tools and techniques that can be used by game software developers to determine how to design software systems with components that are subject to different licenses (like Unity3D above), but in ways where the rights and obligations are tractable, and where early design choices can be made that minimize unwanted license constraints or undesired license obligations (which is not clear or possible with Unity3D). Consequently, we have developed a formal scheme for modeling and specifying software licenses, IP rights and regimes, as well as prototyped some tools for analyzing the propagation of IP rights and obligations within systems composed with software components subject to different IP licenses. Subsequently, we prepared and include two reports to help document this forward-looking research. In short, it appears that our approach demonstrates that it is possible to build tools and analysis techniques that can be employed by game software (or content) developers or others interested in IP licenses (e.g., lawyers), in ways that are more readily tractable and can potentially be supported by next generation software development environments or SDKs. Finally, though not yet explored, we also believe our approach to IP license analysis may be readily extended to also apply to commercial virtual worlds where in-world objects may be composed of geometric data models and animation scripts from multiple independent sources, again subject to different IP licenses

Future opportunities for game-based virtual worlds and related market data

As during each year of this project, we have sought to present our collective team view about the future of computer games and virtual worlds, we continue to do so here in this report. As such, we have prepared and included a new presentation that outlines our areas of interest for research and development of games and virtual worlds. This includes highlights regarding the emerging interest in developing game-based virtual worlds to support advanced scientific research in domains such as computational astrophysics, earth system science, health care (physical therapy and rehabilitation), energy and natural resource management, and others, as well as new types of games, game-play devices, and game play experiences.

We also have growing awareness of a major shift in the marketplace for game-based virtual worlds (also identified as "casual MMOGs" in our 2007 video seminar). In particular, recent market figures spanning English-speaking regions (so no data on non-English speaking markets or non-English based virtual worlds like *CyWorld* or others), now suggest that nearly 2 of 3 registered users of game-based virtual worlds out of 800M users are now in the 5-15 age range. This means that children and young people are the primary market for such commercially deployed systems. Consequently, this may shift our view about what kinds of technologies and applications of game-based virtual worlds are likely to have the greatest commercial potential, or global market reach in the next 2-10 years. Our previous ideas about the future of game-based virtual worlds spanning from the video lecture series in late 2007 through our identification of future money-making opportunities for game-based virtual worlds presented earlier in our 2009 mid-year report also merit consideration and comparison here, given this new information.

Thus, the two presentations that are included help document our views about the possible futures of computer games and virtual worlds

Recent developments at UCI creating new research center and laboratories for computer games and virtual worlds

Next, we note that the UCI School of Information and Computer Science, along with other faculty affiliated with the UCI Game Culture and Technology Lab, has established a new research center as of late Summer 2009 to focus on the culture and technology of Games and Virtual Worlds development and use. The research unit is called the *Center for Computer Games and Virtual Worlds*, http://cgvw/ics.uci.edu, and it is based within the UCI Donald Bren School of Information and Computer Sciences. The first public announcement of the Center appeared on 1 September 2009, see http://www.today.uci.edu/news/nr_gamecenter_090901.php. More than 35 UCI professors across multiple disciplines have signed up to become part of this center, as well as to become involved in future research projects addressing various aspects of games and virtual worlds. Such a high level of faculty participation indicates that UCI is poised to become the world's leading research center for computer games and virtual worlds, as no other university or research center has anyway near this number and diversity of participating faculty. Our collaboration with DIP and other research partners has helped to advance faculty and student interest, as well as future participation in new research projects based in the Center. Also, the growing number of UCI faculty now actively interested in participating in game/virtual world research suggests that larger and more topically diverse projects can be contemplated in the future. Similarly, a large number of undergraduate students (40-60) already at UCI have formed a “video game developers club” which is also affiliated with the Center.

The Center is initially organized around the creation of two new computer game and virtual world

research and development laboratories that host sponsored research projects, like our DIP project and our NSF project. The first (and smaller) laboratory focused on engaging student game developers into game-based research projects, and one larger focused on empirical studies of user behavior in individual, small or large group players. The small laboratory was established and equipped during Fall 2009. This laboratory includes five 3D stereo displays, four rack-mounted game servers, and six personal computers, each with 5.1 channel audio. The lab also provides access to each of the major game consoles (Xbox360, Nintendo Wii, PS3, PSP), multiple web cameras, gigabit networking, as well as new game play devices like "brain-computer interfaces." This lab is thus equipped to engage in the kind of game research studies. The second (and larger) laboratory has been allocated nearly 4000 sq. ft of new laboratory space, covering more than one dozen different research zones, data collection, and observation rooms. A planning design for equipping this laboratory with a wide variety 3D virtual world displays and immersive environments has been prepared and completed in late 2009 in collaboration with EON Reality Inc., based in Irvine, CA. Photographs of the small lab, and floorplan for the large lab, are documented as presentation materials in this report.

Finally, we also note that the UCI Bren School of Information and Computer Sciences has committed to not only supporting research into computer games and virtual worlds, but also encouraged us to propose a new undergraduate degree program titled, "Computer Game Science." A proposal was prepared and submitted in Fall 2009, where this would be a new kind of degree that combines the science and technology of computer games together with cultural and behavioral studies of the development and use of computer games and virtual worlds. The program calls for 12 new computer science courses on topics including: history of computer games; modeling and 3D world development; game engines; and others. Information about this exciting new degree program received local media

coverage in the O.C. Register, http://irvineretail.freedomblogging.com/2009/09/11/uci-students-could-soon-major-in-video-games/5143/, and later even made front page news of the *Los Angeles Times*, on 30 November 2009, and also published on the Web at http://articles.latimes.com/2009/nov/30/local/la-me-uci-video-games30-2009nov30 . Information about this new degree program can be found on the Web at http://www.ics.uci.edu/ugrad/degrees/degree_cgs.php , and the program will start admitting its first class of Freshman students in Fall 2010.

New game concepts and emerging proposal ideas for 2010 and beyond

Last, there have also been research activities that focus on the development and refinement of new concepts and approaches for new R&D projects addressing emerging opportunities in computer game culture and technology. As this effort represents the beginning of one or more possible future research projects, the one report in this section outlines a set of possible projects for which we, UCI and DIP, can collaborate on researching starting in the last part of 2009 or soon thereafter. As the material in the report for this section have recently been discussed at length via videoconference and associated email correspondence, this material is included here simply to document where we started from and perhaps where we may be going. However, ongoing discussion and collaboration will determine which topics will emerge as the basis for our next project(s) between DIP and UCI.

- Games for health care, rehabilitation, physical therapy and human performance improvement
- Games for energy management and improved utilization within homes and businesses
- Games for environment and natural resource management (e.g., regional water supplies and recycling), and for improved conservation, within homes, business, and regional ecosystems.
- Games and virtual worlds targeting young people in the 5-15 year old range focusing on informal education and situated learning of science, technology, engineering, arts, and

mathematics (STEAM) subjects, aligned with national education standards in each subject area.

- Games and virtual worlds as new media for the creation, presentation, and documentation of visual and performing arts exhibits, art works, live and telematic (geographically dispersed by network linked) performances.

Topics such as these may serve as a basis for new collaborative research and development projects between DIP and/or Daegu City, together with the UCI Center for Computer Games and Virtual Worlds, its faculty, students, and research staff.

We now turn from descriptions of our most recent research results from the last half of 2009 to a overall review of the results, findings, and lessons learned from the project during its three year duration from 1 January 2007 through 31 December 2009.

Overall Project Results, Findings, and Lessons Learned

This section will review, summarize, and critique what we have accomplished and learned through the course of this project, and the international research collaboration that it represents.

Project Results and Findings

Over the three years of this projects, numerous research results and findings were developed, realized, and demonstrated. These are exhaustively documented in the five project reports (including this one) that have been produced and delivered since July 2007. More than 1000 pages of documented research results and findings have been produced and delivered to DIP. These reports represent a key component of the knowledge that was created, refined, and delivered for transfer to DIP and Daegu City by the UCI project team. While it is possible to review and recapitulate the contents of each of these reports, it

is simpler to direct the interested reader to each of these reports, which can be found on the Web at the following locations:

- http://www.ics.uci.edu/~wscacchi/GameLab/UCI-DIP-Project/UCI-DIP-Report-July07.pdf
- http://www.ics.uci.edu/~wscacchi/GameLab/UCI-DIP-Project/UCI-DIP-Report-Dec07.pdf
- http://www.ics.uci.edu/~wscacchi/GameLab/UCI-DIP-Project/UCI-DIP-Report-July08.pdf
- http://www.ics.uci.edu/~wscacchi/GameLab/UCI-DIP-Project/UCi-DIP-Report-July09.pdf
- http://www.ics.uci.edu/~wscacchi/GameLab/UCI-DIP-Project/UCI-DIP-Report-Dec09.pdf

Review of each of these reports is strongly encouraged now that the final project report has been included. These reports cover a wide range and diversity of research topics that span:

- tools, techniques, and infrastructure environments for facilitating the collaborative development and use/play of different computer games and virtual worlds
- heterogeneous devices and mechanisms for play games or interacting within/across physical-virtual worlds
- understanding how computer games and virtual worlds are still evolving and mostly evolving away from game consoles for high quality games/MMOGs, though the consoles maintain good product longevity in their respective markets.

Our insights about the future of computer games and virtual worlds are continually updated and adapted to account for advances in the technology and culture of computer games. Our ideas about where the most likely markets for high growth game products and MMOG/virtual world services seem very plausible, based on a review of what was first presented in the video lectures series in 2007, and updated in our money-making ideas for games presentation from Spring 2009. In short, we at UCI

remain reasonably confident about our ability to detect, understand, and characterize emerging commercial opportunities for computer games and virtual worlds for the U.S. market, and where they are headed. We welcome the opportunity to continue to engage in such efforts going forward.

Lessons Learned

- *Research projects require flexibility and adaptability, rather than fixed plans and schedules* . Both parties to this project found it necessary at different times to adapt to changes in their respective work environments. DIP proposed changes in the Spring 2007 to shift from two large-scale international workshops to a video lecture series that could be delivered over a wideband videoconferencing system. DIP also needed to make changes in the provision of funds to the UCI team due to unanticipated changes in currency exchange rates between the Korean Won and US Dollar. The UCI team needed to expand and adapt the choice of topics and sub-topics that arose during the course of the project over the three years. The UCI team also needed to have more flexibility to control research project staffing. DIP and UCI also negotiated changes in project staffing relative to the original project proposal. In contrast, if both parties insisted on strictly adhering to the plans, details, terms and conditions that were included in the original project proposal, then either or both parties may have been unsatisfied with the outcomes. So we believe both parties showed good judgment and wisdom by recognizing the need to adapt to each others needs, and to respect their choices for how best to proceed. Consequently, it is clear that flexibility and adaptability are key characteristics of a successful research project collaboration, and they should also be expected to characterize future research project collaborations between DIP, Daegu City, and UCI.
- *Video-conferencing system utilization and visibility.* Both parties found their respective

investments in the acquisition and use of video-conferencing systems was critical to overall success of project. These systems enabled on-going, on-demand communication between project participants and others from DIP, Daegu City, and UCI. These systems were critical to the presentation of video lecture series conducted in Fall 2007. Thus, the choice to acquire and use such systems was well-justified. Finally, it may of similar good value to consider an upgrade to high-definition (1080P) video conferencing technologies which are now becoming widespread, and low cost. UCI has recently upgraded its facilities to this HD capability.

- *Periodic project team visits are essential, valuable, and help build trust among project participants*. The ability for US and Korean project members and others to travel, visit, and work with one another at their respective worksites was critical to project ongoing success, visibility, awareness, and improvement. These meetings were also important to building and sustaining trust and conviviality among the project participants. Future research collaborations should continue to plan for and support such international travel and meetings.

- *Renegotiation of project scope and activities is challenging—everything cannot be planned or finalized before the project starts*. A very long period of negotiations was incurred to establish and fund the project proposal, from late 2005-early 2007. These negotiations and the overall project succeeded in establishing a productive and trustworthy relationship between DIP, Daegu City government officials, and UCI. Going forward, it is expected that any new projects between these partners will be able to engage in straightforward, simpler, and more timely proposal preparation and contract negotiations. Ideally, future projects would be able to reuse or adapt project contractual arrangements established and agreed to through this project.

- *Relationship with games companies in Daegu and U.S. is challenging and full of surprises* . One goal of the project was to help facilitate relationships and business exchanges between game

companies and other business in/around Daegu City, with their counterparts in/around Irvine. DIP is positioned to interact with game companies in Daegu City, but many of these companies are small and lack experience in doing business in the U.S. UCI GameLab (and now Center for Computer Games and Virtual Worlds) is not in a good position to facilitate business-to-business exchanges, but is in a excellent position to engage in research and education. Visits to game companies in Daegu City and around Irvine by the UCI and DIP partners revealed many challenges in managing expectations between research efforts and day-to-day business needs of the companies involved.

Game companies are highly motivated and focused on making payroll, maintaining cash flow, and financial viability all while trying to make game products they understand and are capable of producing for their respective markets. The UCI team believes there were local U.S. game companies interested in partnering with Korean game development studios, such as K2Network and EON Reality Inc.

K2 Network, a Korean-American owned game company which pioneered free-to-play MMOGs imported from Korea to the U.S. and other global markets, repeatedly indicated that the American/English-speaking game markets are quite different than the Korean/Asian markets, and that most Korean games will not succeed in English markets, based on their experience with both Korean and U.S. Markets. It was their view, as well as the view of the UCI research team, that computer games and virtual worlds embody cultural practices and assumed patterns of play/interaction that are often transparent or unseen by their developers. In general, these practices or assumptions do not translate across cultures, and this means that players in different cultures will find games that are quite successful in their home markets are found to be strange, weird, goofy, or boring outside their home market, even though the games may be localized to

national languages. Natural language localization does not imply nor guarantee cultural translation or localization. Subsequently, this means that some U.S. made games/MMOGs can succeed in Korean/Asian markets, but most will not. Similarly, some Korean made games/MMOGs may succeed in American/English-speaking markets, but most will not.

EON Reality sought to engage visitors from Daegu City and DIP in creating an advanced virtual world and computer game development center in Daegu. Visitors from DIP and Daegu City met with senior executives from EON Reality, headquartered in Irvine. Executives from EON Reality traveled to Daegu City to meet with government officials and business leaders there. However, negotiations between business representatives in Daegu and EON Reality did not realize mutually agreeable terms for establishment of such a development center. EON Reality did however move on to establishing a different business relationship with parties in Busan, focusing on cinema and new media production.

Next, game companies like Blizzard Entertainment and most others around the Irvine area were not interested in working with small, unknown game studios in Daegu, but were interested in business partnerships elsewhere in Korea (Seoul).

Last, business relationships with other Korean game companies and UCI was accomplished large Korean game companies like NCSoft and NHN, both of which have established U.S. offices and MMOG operations near UCI. These companies may have the financial, staff, technical resources, and diverse game product offering needed to succeed in the U.S. market. Consequently, future opportunity in facilitate business to business interactions among Korean-U.S. game companies may be best served by partnering with game or media companies that already are committed to establishing markets outside of Asia, and in the U.S.

- *Establishing relationships with local government were very successful.* UCI helped facilitate a

number of meetings with members of the Irvine City government, including members of the City Council, and the Mayor of Irvine, Suhkee Kang. Mayor Kang expressed much interest and willingness to work with Daegu City government officials who seek to establish a larger presence and awareness of Daegu within Irvine, perhaps to include the development of a Korean-American Cultural Center within the Great Park in Irvine. The Great Park is planned to become the largest city park in the U.S. Our Daegu City representative, Mr. Kook Joong An, was a most congenial and eager visitor to the UCI project, and he helped open many doors to government officials in Daegu City and he (as well as Daegu City) benefitted from personal meetings with government officials in Irvine.

- *Establishing relationships with Korean academic game researchers were very successful* . UCI had more than a dozen academic visitors from different universities across Korea come to meet with project team members, based on what they had learned about the project while still in Korea. Our long-term project visitors, Prof Jong Weon Lee, and Prof HeeDong Chang, have been The project was successful in helping to bring recognition within the Korean academic game research community to the efforts and collaborative research partnerships that Daegu City and DIP were pursuing with UCI. The project helped bring national and international recognition to the project participants, and many new collegial relationships and emerging research collaborations have been established.

- *Project financing had some surprising challenges* . There were some unanticipated problems with currency exchange rate fluctuations. This resulted in a substantial reduction of project funds received in U.S. dollars by the UCI team, though there was no change in funds available in Korean Won at DIP. UCI sought a no-cost extension during the Fall 2009 to allow the project to continue and for funds to be spend into 2010, but DIP decided it wanted to complete project

expenditures at UCI by end of 2009. Future collaborative research projects between DIP, Daegu City, and UCI should more clearly spell out possible ways for mitigating problems in project financing due to changes in currency exchange rates, and project performance periods.

- *Project staffing realized many successes and a few challenges* . There was continued success in project management and liaison at DIP and UCI. DIP and UCI had top quality personnel on hand to manage the project collaboration. However, there was a challenge early on in the effort to recruit and appoint U.S. project manager to reside in Daegu at DIP. No such person could be found though many candidates were recruited and interviewed.

  There were also successes and challenges with international researchers coming from DIP and Daegu City to work at UCI. There was great success with the Daegu City government agent, Mr. Kook Joong An. There was also great success in establishing productive collaboration with academic (post-doctoral) scholars from Korean universities, Prof. Jong Weon Lee and Prof. Hee Dong Chang. However, there was a challenge in working with one project staff from "Company A" whose commitment to engage in research-level project work was never successfully demonstrated nor substantiated. This person may not have been prepared to work and live in the U.S. by himself, without a family to support his personal needs.

  There was also a challenge in cross-cultural language skills, in that visitors to need to be reasonably fluent in a second language in order to be comfortable at work and in the larger community in another country. The lesson learned here is to be sure that Korean visitors are either comfortable with their English proficiency prior to coming to the U.S. for an extended stay, or to plan to engage in English tutoring, or to be able to hire a part-time interpreter, such as Korean-American student. Similarly, U.S. visitors to Korea need to have Korean-English interpreters available to facilitate business meetings, or meetings with government officials.

Final Remarks

With this preceding project areas in mind, we now turn to present the materials that are included in the remainder of this progress report, which help to document what we have accomplished and learned during our effort from 1 July 2009 through 31 December 2009., and also summarizing the results, findings, and lessons learned across the entire project period from 1 January 2007 through 31 December 2009.