BROCCOLI FOR CHOCOLATE: DISCOVERIES FROM THE MAKING OF SERIOUS VIDEOGAMES

by

GABRIELLE GARNER

(Under the Direction of Dr. Michael Orey)

ABSTRACT

This dissertation presents a holistic picture of the ways in which sociological factors and manifestations of culture influenced the work of innovating a collection of serious videogames within a business entity, organization, and diverse workforce, collectively referred to as Vision Launch. Empirical evidence was drawn from 22 individual interviews, field notes, internal documentation, photographs, sketches, digital prototypes, PowerPoint presentation slides, emails, and written memos related to the team's process for innovating serious videogames. Facilitated with an ethnographic approach to data collection and a grounded theory approach to data analysis, this study characterizes Vision Launch as a culture system in which all team members continually engaged in the practices of innovation, learning, and strategic adaptation. Derived from these findings, a grounded theory has been proposed, which emphasized the discovery that in systems of innovation, especially those involving serious videogame design and production, the core competencies of the system's human workforce are the abilities to innovate, learn, and adapt within a variety of communicative contexts and situations.

Supported by relevant field observations and individual interview data, patterns of activity showed that design (a creative and intuitive process), production (an iterative and

transparent process), success (the consistent delivery of high quality games), and sustainability (the prolonged corporate livelihood of the design and production system) were dependent upon dynamic innovation practices that accounted for collaborative interaction among professionally diverse stakeholders; the potential for conflict; the need for critical awareness, tactical negotiation, adaptability, resilience, and effective business acumen; and the vital importance of adhering to a core organizational vision. Vision Launch leaders' strategic broadcast of a concrete and relevant vision, embedded within an Agile Scrum approach to production, led to the structured emergence of an exclusive culture system, shared among members of the Vision Launch innovation team.

INDEX WORDS: Instructional design, Game studies, Organizational culture, Scrum, Agile

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DEDICATION

For Mom and Dad

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To Dr. Orey, I am most grateful. One day, while feeding his fish on the sixth floor of Aderhold Hall, he was reflecting upon his experience of doing research. A couple of fellow first-year students and I were catching up on morning emails when he told us that working on a research project was a lot like working on an old truck. You and your buddies kind of have to break apart the engine, talk about what is happening or what is missing, and after deciding on a plan of action, you put it back together, piece by piece, only to have it inevitably break again. I believe Dr. Orey loves this process.

After working along with him for the last four years, I have found that his work was never really about doing research, building a start-up business, teaching, reviewing my dissertation, nor restoring automobiles. It has been less about playing by rules and more about the joy of working with people. During my experience of collegial research, I found myself to be both stubborn and a little nutty, but being and finding a friend and comrade has made all the difference. For his unshakable support, honesty, patience, open-mindedness, diligence, and selfless humility, I am so grateful, and I will never forget the favor of his mentorship. Salud.

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INTRODUCTION

In the last two decades, corporate providers of information, interactive media, and online services have capitalized on and cultivated the convenience, utility, and expansion of personal consumer access to digital media. Companies, such as Skype Technologies, have made it possible for a salesperson in Beijing to present a business proposal in Australia without incurring any travel costs. With the launch of Mint.com, Inuit Incorporated gives people the freedom to maintain household finances from anywhere there is Internet access, using its secure online settings and services. As the industries of journalism, advertising, communication, entertainment, and education have continued to expose consumers to refined applications of digital media, computers and mobile devices have become portals of cultural participation and capital flow.

Further enforcing its own convenience, practicality, and desirability, personal access to digital media has become a standard feature of work, play, and life among members of the modern global network, which refers to the "relational, complex" culture (Fischer, 2007, p. 1) of people and activity that influence, participate in, adapt to, and consume emergent media in the globally networked, online space. Apple Incorporated has continued its tradition of empowering consumers and personalizing the human-computer experience with the launch of iTunes U. In this online media marketplace and consumer hub, users can freely download a collection of videos from classes taught at some of the world's most prestigious universities, including Massachusetts Institute of Technology (United States) and Oxford University (England) (Apple, Inc., 2011).

Since 2004, Facebook has become the largest social networking website in the world, providing more than 7.2% of the world's population (over 500 million users) with "technologies that facilitate the sharing of information through the social graph, the digital mapping of people's real-world social connection" (Facebook, 2011, par. 1). With broadened applicability to the daily work, play, and life of a burgeoning global network of people, personal access to the online world has made it more relevant and readily possible to do, make, communicate, and learn through personal interaction with digital media.

With the persistence of advancements in digital architectures and capabilities that compliment my own worlds of work, play, and life, I have come to expect that the economic forces supporting the modern global network will continue to sustain the improved functionality and convenience of my connection with computers, media devices, and software applications. Since its original debut in 1988 on the Apple II computer, *John Madden Football*, now known as the *Madden NFL* series, has been designed and delivered for all of the following platforms: Apple II, Macintosh, Windows PC, DOS, SNES, Sega Genesis, 3DO, Nintendo (DS, 3DS, GameCube, and 64), PlayStation (versions 1, 2, 3, and Portable), Xbox (360), and iOS ("Madden NFL," n.d.). With continued feature and platform updates, such as the integration of online "team play" in 2010, EA Inc. has continued to achieve great success by providing consumers with opportunities to compete and play from the comfort of most homes across the developed world. Representative of the current trend in personalizing, expanding, and improving the digital media experience, the videogame industry continues to transform individual home play spaces into local and international play portals with yearly, monthly, and daily updates to the features of its game consoles and videogames.

The expectation of strategic, adaptive, exploratory, timely, and even accidental modifications to digital media has influenced and been influenced by individuals and groups within the modern global network, including individual consumers, institutions, organizations, corporations, and governments. In sum, the technological infrastructure of the early twenty-first century global network has been marked, thus far in 2011, by tremendous momentum and agility in the pursuit and creation of new knowledge, abilities, and artifacts among digital citizens. The ever-improving capabilities and services provided for communication (Skype.com), financial management (Mint.com), education (iTunes U), social networking (Facebook.com), and recreational play (*Madden NFL*) represent activities and artifacts that symbolically trace the footprints of today's global network. Deuze (2007) argued that the provision of these services via digital media not only represents a life increasingly lived online, but these mediating technologies are also "case studies of how contemporary life gets expressed through (new) media" (p. viii). From the point of early childhood, humans' access to and interaction with the global network is now reinforced by social acceptance, and mediated by the power of tools, touch screens, and online networks.

At this point in history, it is highly probable that digital media will become a ubiquitous form of participation in the developed and developing worlds, which makes knowledge of the inner work of digital media production a useful and empowering life resource. As seen in shared YouTube.com videos, Wordpress.com weblogs and portfolios, and "viral phenomena and Internet memes" published on sites like KnowYourMeme.com, digital citizens are turning new and old media into social capital, developing their own individual power to express themselves and socialize with each other by advancing their abilities to produce and share their own media. According to Deuze (2007), having a "critical awareness" of media, including how to interact

with it and how to make it, is important "not just to inform and assist those vying for a successful career as a reporter, advertising creative, television producer, or game developer. This [critical awareness] to empower anyone entering the current and near future global economy, where media is ubiquitous and pervasive devices, as tools for social organization and accelerators of everyday experiences, provide the dominant frame of reference" for life lived in the modern global network (p. x).

At once archaic and progressive, the zeitgeist of *creation* observed with the influx of media shared among consumers has been captured in this dissertation as it influenced and was influenced by an organized infrastructure of digital media production in which the focus of study was collaborative work among a team of creative visionaries and makers, including producers, educators, designers, artists, engineers, and researchers. The purpose of this dissertation is to produce knowledge of the infrastructure supporting the collaborative practice of producing a specific form of digital media, serious videogames. Informed by an extensive cache of empirical data, which was collected over the course of two years of ethnographic fieldwork, the dissertation presents a production team's experience creating serious videogames as the team grew its capacity for success and sustainability while enduring natural and constant change within the corporate infrastructure.

Serious videogames

Serious videogames are unique digital media artifacts, or innovations, representative of an exploratory and strategic mash-up of ideas about the influences that education and entertainment could or should have on one another. The phrase, serious videogames, has been selected to refer to digital game environments designed to entertain and to teach concepts through play. The root subject, videogame, refers to an interactive digital environment in which

users are exposed to an enjoyable and engaging experience of play. The added descriptor, serious, is a quality referring to a system in which users are expected to achieve learning gains through exposure to pedagogically oriented content, such as geometry concepts or international conflict resolution tactics. In a serious videogame, the activity of play within the videogame is the catalyst for the following intended cause and effect: as the user plays the serious videogame, he/she is entertained and engaged, while internalizing intentionally integrated content and constructing new knowledge. Findings from this investigation inform our understanding of the inner work involved in the creation of serious videogame artifacts, which have been designed, produced, and distributed for a globally networked society.

This study of the process of producing serious videogames has yielded these effects: 1) by observing, over time, what happened and what people had to say about the activities in which they were involved, it was possible to view areas of efficiency, deficiency, and growth as they were influenced by strategy, organizational demands, experimentation, and accident; and 2) with detailed knowledge about what it took to both sustain and endure a specific system of innovation that produced serious videogame, theory grounded in the evidence of live practice was developed as it pertained to the influence of culture in a system of innovation.

Corporate strategy and organizational emergence: A brief overview

Fueled by the need to maintain its competitive leverage among consumers in the global network, the company involved in this study began implementing a mission that emphasizes the development of engaging and innovative delivery methods for advancing children's learning of a proprietary curriculum. After roughly three years of assembling, deploying, reorganizing, and relocating the newly formed division responsible for facilitating this mission, the company began to see growth in its organizational capacity for creatively wielding the innovative edge of

education within the entertainment space. With the looming possibility of corporate restructuring, Vision Launch executives refined, broadened, and validated both its mission and its ability to carve a viable space for education and entertainment in the modern global network.

Mediated by the competitive pursuit of consumer satisfaction, the company demonstrated a long-standing history of innovation through collaboration within a complex, networked group of diverse experts. With the corporate resources and support to implement sustained innovation, Vision Launch spent two years forming a team of internal and contracted employees that provided a diversity of expertise in the areas of elementary education (K-5 curriculum and instruction), performance assessment, instructional design, videogame production, entertainment (game) culture, engineering, and corporate research and development. During this time, the growing team was charged with the task of producing entertaining videogames, rich with opportunities for learning K-5 concepts in Science, Mathematics, Art, Language Arts, Music, and Social Studies. Throughout the completion of this task, Vision Launch deeply expanded its networked knowledge base in both videogame production and elementary education. Through developing a learning curriculum, building it into an assessment system, and integrating these networked systems with the game design and production process, the experiences of collaborative workers within the production team were tracked over the course of two years of fieldwork.

The diverse experts that Vision Launch executives strategically chose to bring “to the table” were naturally suited for specific kinds of roles, which helped to structure most individual contributions within the team. As team members’ contributions unfolded, collaborative work appeared to be the core activity among all team members. Trained as a civil engineer and contracted by Vision Launch, one “instructional designer” commented in an interview, “There's

nothing that I do that's mine. My whole job is, basically, interaction and bringing people together and validating what other people have done" (Vision Launch Instructional Designer, personal communication, November 11, 2010). By making collaborative practice the central unit of analysis, this study shows how professional diversity and expertise, cultivated in the spaces of work and life, collectively challenged, reinforced, and strengthened the Vision Launch production team's capacity for creativity and success in its creation of serious videogames and in its sustainability as a viable division of the company.

Educational research in the production of serious videogames: The design problem

Beginning with the release of *Oregon Trail* for the Apple II computer in 1978, the production of serious videogames has been in a state of broad experimentation. As with their predecessors, emergent in industries of entertainment and education, serious videogames have been subject to the same critical consumer review that drove iterations of design controversy while the games were in production: To what degree is the videogame capable of both entertaining and educating?

While it is scientifically acceptable and possible to argue, test, and offer contextualized, empirically based theories about the degree to which a game entertains and educates after it has been created, a design approach, grounded in practice, that outlines a culturally relevant process for creating games that successfully entertain and educate was unable to be located. At this point, experimentation with systematic processes for building serious videogames has yielded a useful, albeit scattered, collection of lessons learned among academic researchers; however, the consistent success of one particular process has not yet been proven for models that address production procedures (Barab et al., 2007; Gunter, Kenny, & Vick, 2006; Moreno-Ger, Burgos, Martinez-Ortiz, Sierra, & Fernandez-Majon, 2008; Shute, Ventura, Bauer, & Zapata-Rivera,

2009; Sorensen & Meyer, 2007). The degree to which companies, researchers, and educators achieve both learning and fun in a serious videogame is variable and inconsistent, and there is no single step-by-step formula for creating the ideal serious videogame (Harteveld, Guimaraes, Mayer, & Bidarra, 2010; Rankin, McNeal, Shute, & Gooch, 2008). Because the process of designing this genre is so heavily reliant on the ambiguous creativity of its designers, I have considered that an inflexible, top-down model may not be a fitting approach to the making of serious videogames.

The general aim of this investigation was to understand more about the ways in which the team's collaborative practice successfully and unsuccessfully facilitated its resolution of the central design problem: the game must be capable of both entertaining and educating. In the context of academic research, this study addressed issues arising from these on-going conditions:

1. Unlike non-serious videogames and instructional media, serious videogames were being forged through interdisciplinary (and thus professionally multicultural) convergence within a team of educators, game designers, producers, engineers, and instructional designers.
2. Collaborative interaction among professionally diverse team members was giving rise to multicultural affordances that appeared to hinder productivity.
3. Little empirically based knowledge was published in the academic literature on the influence of culture in the practice of collaborative innovation among geographically and professionally dispersed team members involved in the making of serious videogames.

Through critical comparative analysis of patterns in the applied practice of innovation, this report contributes (a) a holistic portrait of Vision Launch culture in the work of innovating serious videogames that aimed to entertain and expose children to educational content through play, and

(b) an empirically grounded theory about workforce competency and skill in the practice of innovation.

Professional culture in collaborative labor: A list of research questions

To clarify the influence of professional culture in the work of serious videogame production, the following research questions were posed: In what ways has culture influenced the work of serious videogame production?

a. How did design team members define their roles, responsibilities, activities, experiences and contributions?
b. In what ways did team members' perceptions of roles, responsibilities, activities, experiences, and contributions influence the production of serious videogames?
c. What types of affordances surfaced as a result of team collaboration and interaction within the context of the team's participation in serious videogame design practices?
d. How did the team mediate differences in personal worldview and perspective as they arose through various activities, such as the resolution of design problems?

Navigating the inquiry of culture in process: A summary of the research methodology

Between May 2009 and May 2011, I examined the ways in which the Vision Launch learning curriculum was designed and integrated into the innovation process. The aims of this study were to provide a holistic portrait and a grounded theory about the collaborative work involved in producing a series of serious videogames. To achieve these goals, ethnographic methods were used throughout the data collection process. Through constant comparative analysis of this emergent portrait of collaborative practice, grounded theory methods were used

to generate a theory that would address practical ways of successfully achieving production goals in the context of serious videogame production.

Field notes from participant observations, reflective and analytic memos, 23 individual interviews, and internal documentation, including photographs, video and audio files, sketches, digital prototypes, presentation slides, and emails, were collected over the course of two years in my work as an instructional design apprentice in the Vision Launch group. Informed by early analysis of preliminary ethnographic field observations, memos, and informal conversations with key informants, affordances arose from the design and development process that appeared to be a direct result of cultural differences within the production team.

Aligned with the grounded theory approach to analysis (Glaser & Strauss, 1999), the data was continually coded for multicultural affordances and features that addressed each of the research questions as they arose throughout the collection process. For example, interactions between contracted educators and executives from Vision Launch revealed identifiable differences in vocabulary used to speak about similar topics and differences in the interpretation of meaning.

Over time, comparative analysis of coded field notes and emails between participants revealed more substantially that the game development group and the education group were each made up of highly creative experts from very different professional backgrounds, which appeared to directly influence their interpretation and use of vocabulary. Transcripts from individual interviews, completed during their third year together, showed a more consistent use of terminology in descriptions of various aspects of the process. In this study, ethnographic data collection methods supported the grounded theory approach to analysis.

Discovery of process in culture: A formative outline of the text

Inclusive of this introductory chapter, the first half of this text provided an initial orientation to the practice of designing and developing videogames and serious videogames. Based on early observations in the field, the convergence of professional cultures within the production team appeared to directly influence the production process, including causing shifts in activities, roles, and responsibilities. Discovered through a review of empirical research, shown in Chapters 2 and 3 of this text, it appeared that researchers from the fields of education, game studies, instructional technology, human-computer interaction, and even science and technology studies rarely addressed the direct influence of cultural convergence in the collaborative practice of producing serious videogames.

The literature review presented in Chapter 2 defines online, non-serious videogames as artifacts of digital media and situates them within the context of their design, distribution, use, and influence in the modern workforce. Chapter 3 highlights the convergence of industry and culture in serious videogame production as it is presented in empirical studies published between 2006 and 2011. Discussed more thoroughly in Chapter 3, few empirical studies (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Gunter, Kenny, & Vick, 2008; Harteveld, Guimaraes, Mayer, & Bidarra, 2010; Moreno-Ger et al., 2008; Klopfer & Squire, 2008; Raybourn, 2008) identify affordances arising from challenges in the collaborative work of designing serious videogames through a lens that draws attention toward the experience of designing. The literature review validates the presence of collaborative practice in the making of serious videogames, based on a critical evaluation of designers' and researcher-practitioners' values, activities, and tools.

Framed as a cultural system, the system that emerged through the process of designing, developing, and delivering a collection of serious videogames has been presented with relative

transparency in the second half of this text. From the perspective of a researcher and instructional design apprentice, Chapter 4 describes the methodology used to investigate the context of serious videogame production as a cultural system and the influences of applying ethnography and grounded theory methods within a rigid (Latour, 1991) corporate infrastructure. The chapter explains, for example, the ways in which my perception of multicultural affordances arising from collaborative interaction among diverse professionals within the team was shaped by empirical data that had been collected through participant observation and additional fieldwork.

Chapter 5 reports the analysis of data and findings from the study of professional convergence in the production of serious videogames. In this essay, I present a working theoretical synthesis of the discoveries that in the case of Vision Launch, sociological, technological, and economic forces promoted and constricted the team's developmental practice of innovation through challenge, change, and conditioning, which led to the organization's prolonged, enduring trajectory of collaborative innovation. The analysis of findings clarifies the ways in which the collaborative practice of innovation, including the competencies and skills of all team members, naturally reinforced the organic co-creation of the team's collective culture.

Over time, the team's culture became increasingly more oriented toward success as it facilitated the innovation of eleven live videogames within one year. Chapter 6 reinforces the conclusion that Vision Launch was a culture system of successful serious videogame innovation in which challenge and change (the conditions of corporate rigidity and volatility) were expected, and in which team members' growing abilities to strategically innovate, learn, and adapt elicited effective problem solving throughout the making of serious videogames.

In an empirically based synthesis, this dissertation characterizes the culture of successful serious videogame production as a cohesive, expressive, and emergent system that thrives on the

production team's ability to continually innovate, learn, and adapt within a variety of sociologically, technology, and economically mediated contexts of communication (live conversation and online discourse) and performance (interaction and activity) within and beyond the workplace. In the Vision Launch contexts of communication and performance, the operation and development of its internal culture system gave rise to a workforce that was conditioned to innovate; inquire; negotiate, articulate, and create meaning; design, define, and improve its craft; respect and adopt Vision Launch values; critically reflect on its own performance; and empower itself.

Derived from these findings, a grounded theory has been proposed, which emphasized the discovery that in systems of innovation, especially those involving SVG design and production, the core competencies of the system's human workforce are the abilities to innovate, learn, and adapt within a variety of communicative contexts and situations. The identification and relative articulation of these competencies, based on their emergence in practice, has provided an empirically grounded basis on which to build a deep and relevant understanding of the academic needs of the present and future workforce.

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CHAPTER 2

LITERATURE REVIEW I: LEARNING TO INNOVATE IN THE WORKED AND PLAYED LIVES OF DIGITAL CITIZENS[1]

[1] Garner, G. J. and C. O'Donnell. To be submitted to *International Journal of Learning and Media*.

Abstract

This essay articulates some of the ways in which a unique form of digital media, online videogames, have emerged from and settled within the converging spheres of work and leisure in the early twenty-first century. The social, technological, and economic influences that have shaped these media are exemplified in online videogames that have shown evidence of sustainability in the global marketplace over time. Based on trends observed from a review of previous empirical research, corporate press releases, user-generated wiki content, and interviews with professional videogame producers, it is argued that innovators, or makers of new artifacts, of online videogames are likely to sustain a durable trajectory of innovation within corporate contexts when they can continually adapt to sociological, technological, and economic changes over time. The implication is that successful and well-designed online videogames, particularly massively multiplayer online (role playing) games, require a workforce that is able to engage in the practice of innovation with a persistent awareness of consumer, or player, needs (sociological awareness) and available resources (technological and economic awareness).

Introduction

Throughout the ages of industry and innovation, corporations, educational institutions, government entities, non-profit organizations, investment firms, and banks have continued to influence and adapt to an increasingly globalized, inquisitive, and networked human population. From the moment of their appearance and dissemination, goods, services, and opportunities may become popular in the global consumer market for a day or a decade until the point at which they are sufficiently consumed, undesirable, or obsolete (Jenkins, 2006). Increasing their durability over time, many commercial artifacts, including tools, services, environments, games, or media, have been strategically engineered to either adapt to or grow with technological and societal shifts in popular consumer interests, needs, desires, and capabilities.

The publication, *Consumer Reports*, for example, is a print-based magazine, which was published for the first time in 1936 by "a dedicated band of professors, labor leaders, journalists, and engineers," founders of the Consumers Union (Consumers Union U.S. Incorporated, n. d.). In 1992, the publication reached a paid circulation of five million subscribers, which made it one of the most widely disseminated magazines in the U.S. In 1995, the Consumers Union produced its first multimedia CD-ROM, *The Essential Guide to Cars,* and in response to consumers' growing presence online, their migration toward the online consumption of goods and services, and a seventy-year history of persistent consumer interest in "reliable" product knowledge, *Consumer Reports Online* (www.consumerreports.com) appeared on the Internet in 1997. Five years later, in 2002, the *Consumer Reports* service was being delivered via the Internet to one million paid subscribers, extending its trajectory as one of the most successful subscription services of the new century.

As shown in the case of *Consumer Reports*, one way to successively innovate, disseminate, and sustain modern goods and services has been to be aware of and adapt to the needs, desires, and activities of the global consumer market, enhanced by a keen awareness of the human populous. Another has been to analyze emergent technological advancements and economic trends. The Consumers Union's addition of online delivery to its business model was a direct adaptation to technological advancements (ubiquitous Internet access among existing and targeted subscribers) and consumer desire or perceived need (competitive capitalist market breeds knowledgeable consumers that desire product intelligence). This case highlights a common trend in which the livelihood of modern artifacts, including tools, services, environments, games, and digital media, can be sustained over long periods of time to the extent that they have been developed and adapted with continually up-to-date knowledge of what the consumer market, or society, is and is not doing. Because they appear to respond to and emerge from the activities of an increasingly globalized, inquisitive, and networked human population, the innovation, dissemination, and endurance of digital media artifacts have provided insight into the uniquely constructed needs, desires, skills, and competencies of today's digital citizens (Callon, 1999; Deuze, 2007; Fischer, 2007; Jenkins, 2006).

The purpose of this essay was to articulate some of the ways in which digital media has emerged from and settled within the fault line between the converging spheres of work and recreation in the early twenty-first century. The social, technological, and economic influences that have shaped digital media have been exemplified in the case of online videogames, specifically those that have shown evidence of sustainability in the global marketplace over time. These artifacts have been characterized in light of the discovery that successful online games have not only been sustained by communities of persistent innovation (game developers), but

they have also served to engage the communities that sustain them in the necessary, convergent practices of work and play. In other words, the case of online videogames shows that game development teams have engaged in professional innovation (media work) and play (online recreation) over years and decades of time as a result of the need for successful and sustained innovation.

Artifacts of collaborative innovation

Currently, much of the developed human world works, plays, shops, learns, and manages personal relationships online, and as a socially constructed technological system (Hughes, 1983), the Internet has become a digital repository of human artifact and activity. Facilitating an increase in the momentum of participation across the online space (Callon, 1999), human access to technological tools and a global knowledge base has catalyzed the creation, proliferation, convergence, and consumption of digital media within a vast and diverse community of media-making professionals and consumer creators (Banks & Humphreys, 2008; Consalvo, 2006; Jenkins, 2006).

Media and non-media artifacts generated and perpetuated from human participation in the world wide web have been, among many characteristics, legislative (laws of copyright for media and intellectual property distribution); architectural (dial-up, DSL, or Broadband connections); educational (information search engines, instructional media, online education platforms, web-based academic journals, etc.); recreational (massively multiplayer online games, humorous images, entertainment programming, etc.); personal (weblogs, videos, photographs, etc.); and ground-breaking (coal mines that generate energy to power the system). As long as media makers and system developers continue to engineer and update diverse artifacts that facilitate human regulation (legislative), access (architectural), education (educational services and

media), recreation (entertainment media), expression (personal media exchange), participation (retention of public/private utilities and acquisition of natural resources), and a multitude of other activities and processes in the world wide web, the Internet, as a system, is likely to continue growing, changing, and enduring through persistent social, economic, and technological construction.

Given the strong likelihood of continued growth, change, and endurance of the online space, this essay aims to clarify the sociocultural, economic, and technological mechanisms that shape modern artifacts, which have been innovated, disseminated, and sustained within a seemingly durable, yet constantly changing online network of Internet users. Modern artifacts, such as online videogames, are ones that have appeared in technological form at some point between the turn of the twentieth and twenty-first centuries (1990 - 2011) and represent a recent development and production of a new or seemingly new human idea.

Like most forms of digital media, the design of a videogame is constrained by the desires of a target consumer audience (social force) and stakeholders (economic, social, and technological influence) (Schell, 2008). Its architecture is constrained by the specifications and capabilities of technological tools and platforms (technological and economic influence), along with the varied expertise of its engineers (social influence) (Schell, 2008; Salen and Zimmerman, 2004). Social, technological, and economic forces have the power to shape algorithms, codes, design methodologies, resource allocation, and a multitude of other factors that, ultimately, affect the player experiences and the lifespan of a game's popularity (Consalvo, 2006; Hunicke, LeBlanc, & Zubek, 2004; Montfort & Bogost, 2009; O'Donnell, 2011; Schell, 2008). Successful online videogames are technological systems that sustain the practices of collaborative innovation and play among a diverse group of media makers.

The lasting success of online videogames, like *Ultima Online*, has resulted from stakeholders' collective ability to continuously innovate, update, hybridize, experiment with, and disseminate new media within the online game space over the course of years and decades. With a successful trajectory of continued innovation, *Ultima Online* was released in 1996 as the first massively multiplayer online role-playing game (MMORPG), and nearly fifteen years later, this artifact of innovation is still being played. Five years after its original release, Origin Systems of Electronic Arts reported that "with the release of its latest expansion pack, *Ultima Online: Age of Shadows*, *Ultima Online* (UO) has surpassed 250,000 subscribers" (BusinessWire, 2003). The press release explained that the achievement of such a high number of active players was the result of players' perceived enthusiasm for the dissemination of the aforementioned expansion packs, or new and updated game content, which allowed players to design and build their own houses, provided two new in-game player professions, and introduced a new realm for players to "explore and settle" (BusinessWire, 2003). With the financial support of Electronic Arts[2], Origin Systems' production team became a community of persistent, shared innovation through its continued production of innovation artifacts (expansion packs) over time. This example demonstrates the social awareness of its stakeholders, who were able to adapt their business model (dissemination of expansion packs) in ways that grew with in-game cultural trends and exer-game technological advancements.

As the case of *Ultima Online* demonstrates, among videogames emerging from the late 1990s, sustained play over time was due to continued financial support (EA Inc. supported Origin Systems production team), sustained innovation (release of expansion packs generate

[2] According to the company's website, Electronic Arts Incorporated is "a leading global interactive entertainment software company" (as of June 6, 2011) with over eight thousand employees worldwide (as of March 31, 2010) (http://aboutus.ea.com/home.action, accessed June 6, 2011).

increased player subscription), and the timely dissemination of innovation artifacts (release of expansion packs during the fifth year of operation), which was influenced by producers' awareness of social, economic, and technological trends as well as the availability of financial support and the ability to continually innovate. Over time, the practice of collaborative innovation in the making of these games has generated a similar, consistent impact on the nature of professional media work (Deuze, 2007).

In light of the complex external forces that have affected the innovation, distribution, and sustained consumption (play) of MMOGs, like *Ultima Online*, the work of designing and developing these artifacts can be macroscopically simplified as an input-process-output system in which game developers engage in (expertise and technology as *input*) the process of innovating (envisioning, developing, and releasing new products as *process*) artifacts (online videogames as *output*). However this process of game design and engineering is complicated by the fact that professionals, or stakeholders, who have made videogames have included highly diverse teams designers, artists, engineers, producers, project managers, executives, financiers, subject matter experts from a diversity of fields, and even players (Consalvo, 2006; O'Donnell, 2011; Postigo, 2007; Salen & Zimmerman, 2004). In addition, as a result of improved communication technologies, cultural diversification within cross-disciplinary design teams has increased tremendously (Earley & Mosakowski, 2000; Hitt, Nixon, Hoskisson, & Kochhard, 1999). Given the complexity of managing dynamic, multicultural groups, it has been job of team members, managers, and producers to continually adapt to change with a sensible awareness of the strengths and weaknesses of team members.

Callon (1999) described the approach to "technological development as a succession of steps from the birth of an idea (invention) to its commercialization (innovation) by way of its

development," but questioned "the claim that it is possible to distinguish during the process of innovation phases or activities that are distinctly technical or scientific from others that are guided by economic or commercial logic" (p. 84). Callon (1999) further explains:

> For example, it is often believed that at the beginning of the process of innovation, the problems to be solved are basically technical, and that economic, social, political, or indeed cultural considerations come into play only at a later stage. However, more and more studies are showing that this distinction is never as clear-cut. This is particularly true in the case of radical innovations: Right from the start, technical scientific, social, economic, or political considerations have been inextricably bound up in an organic whole. Such heterogeneity and complexity, which everyone agrees is present at the end of the process, are not progressively introduced along the way. They are present from the beginning. (p. 317)

Considering the reality that sociological, technological, and economic analyses are woven into technological systems through the communities that collaboratively innovate these artifacts, knowing more about their social construction would not only inform our understanding of the practice of innovation, but it would also reveal the nature of durable (Hughes, 1999) online videogames and game developers' expertise about players' desires and needs in online videogame play.

Hughes (1999) suggested that socially constructed artifacts were "durable" when they "project into the future the socially constructed characteristics acquired in the past when they were designed" (p. 77). Considering the diversity of experts employed in the making of videogames, it may be possible to determine, the strength, or projected durability, of an online videogame by drawing connections between its "social construction" and the extent to which they continue to exist over time. Law (1999) explained, "The stability and form of artifacts should be seen as a function of the interaction of heterogeneous elements as these are shaped and assimilated into a network. In this view, then, an explanation of technological form rests on a study of both the conditions and the tacts of the system building" (Law, 1999, p. 113). What has

made the making of online videogames comparable to the engineering of other technological systems is their capacity, through design and engineering, to give life to professional, networked communities of collaborative innovation.

Communities of collaborative innovation

From the perspective of the stakeholders, the Internet facilitates an opportunity for the continued growth of online videogame environments, which in turn helps to extend the livelihood and collaborative practice of innovation within and among production teams. Like many evolving technological systems, "the reality of games is they're never done, especially online games" (Anonymous Videogame Producer, personal communication, November 11, 2010). Theory from the fields of learning sciences and educational psychology has suggested that professional groups which engage in shared social practice, such as the collaborative innovation of videogame production teams, have been socially constructed (Vygotsky, 1978), and over time, the formation of these socially constructed work communities, or communities of practice, facilitates the development of skills and competencies among adults (Lave & Wenger, 1991).

Because successful online videogames have been "never done" (Anonymous Videogame Producer, personal communication, November 11, 2010) and have been continually adapted to meet the needs of technological, economic, and social change (Schell, 2008), team members' continual innovation and adaptation to environmental change has emerged over time within a socially constructed context, further influencing the sustainability of the game(s) they make. If videogame production teams do operate similarly to communities of practice (Lave & Wenger, 1991) and of innovation (West, 2009), then there is a strong likelihood that teams engaged in the persistent practice of videogame innovation have been or were able to strategically develop themselves as professional communities that systematically generated new or adapted skills and

competencies through some combination of these activities, which have facilitated the processes of both innovation (West, 2009) and learning among group members: social interaction and experience (Bandura, 1986), cultural participation (Wenger, 1998), apprenticeship (Brown, Collins, & Duguid, 1989), inquiry (Engestrom, 1999), knowledge creation (Hakkarainen, 2004), flow (Csikszentmihalyi, 1990), creativity (Montuori & Purser, 1999), and creative group thought processes of convergent and divergent thinking (Kaner & Karni, 2007; Larey, 1995).

Based on theoretical arguments and previous empirical research from studies of creativity (Csikszentmihalyi, 1990; Kaner & Karni, 2007; Larey, 1995; Montuori & Purser, 1999) and social learning (Bandura, 1986; Brown, Collins, & Duguid, 1989; Engestrom, 1999; Hakkarainen, Palonen, Paavola, & Lehtinen, 2004; Vygotsky, 1978; Wenger, 1998; West, 2009), I question whether game developers of successful online videogames were more or less equipped to sustain continued innovation when they operated within a context that promoted collaborative learning and knowledge creation. Due to the critical need for persistent and sustained innovation, game developers of successful online videogames continually produced new game content with a keen sociological awareness of the consumer market, which means that many have had to engage in sociological inquiry within and outside of the workplace through play. While further ethnographic study is recommended to define, from observed practice, the activities, tools, strategies, or characteristics of these communities, which most directly support innovation (and thus, sustainability of the videogame), the characteristics of successful MMOGs have been delineated as a way of generating an understanding of the socially constructed expertise of game developers.

Sustainable innovation

In sustainable MMOGs, such as *World of Warcraft*, *Everquest*, and *Ultima Online*, players participated in communities of play within the context of a designed adventure. Closely resembling the designed experiences of successful MMOGs, Campbell's (1949) description of the monomyth has served as a common source of creative inspiration for writers and designers of the entertainment industry (Vogler, 1998), including game developers:

> A hero ventures forth from the world of common day into a region of supernatural wonder. Fabulous forces are there encountered and a decisive victory is won. The hero comes back from this mysterious adventure with the power to bestow boons on his fellow man. (Campbell, 1949, p. 23)

As sustainable online videogames have been consistently innovated, updated, mashed up, hybridized, played with, and disseminated over time, the underlying narrative of successful MMOGs has been based on this concept of an evolving adventure, which is seemingly endless and also reflective of one's experiences in life.

Through innovated, animated, and life-like adventures, game developers have engaged players in the meaning-making activities of inquiry, discovery, cooperation, mentor-apprenticeship, problem-solving, language use, and personal expression have appeared as core features of these communities. Empirically and theoretically oriented reports of research in games and game environments have emphasized game design features and their influences on the cognitive and social development of players (Dickey, 2005, 2007; de Freitas, Rebolledo-Mendez, Liarokapis, Magoulas, & Poulovassilis, 2010; Fields & Kafai, 2009; Girvan & Savage, 2010; Gros, 2007; Kriz, 2003; Rosas et al., 2003; Steinkuehler, 2006; Wideman et al., 2007). To explore the influence of collaborative interaction on young teenagers' cognitive development, Fields and Kafai (2009) investigated players' activity in the context of an after-school club and popular virtual world, called *Whyville*, where knowledge diffusion, learning, and free play were central to community participation. Supported by the methodological approach of "connective

ethnography," Fields and Kafai (2009) documented patterns of social interaction and communication in players' knowledge-sharing activities within real and virtual spaces. In research aiming to draw connections between player psychology and design features of virtual worlds and videogames, ethnographic methods of inquiry have shown that these games have engaged players in cooperation, language use, social interaction, self-expression, and the obvious use of modern technology.

Given the narrative, text-heavy quality of many virtual worlds and massively multiplayer online role-playing games (MMORPGs) of the 1990s and early 2000s, discourse analysis arose as a practical approach to qualitative and ethnographic methods among cognitive, developmental, and educational researchers of player interactivity and communication (Dickey, 2007; Fields & Kafai, 2009; Steinkuehler, 2006). Through "cognitive ethnography," Steinkuehler (2006) applied rigorous discourse analysis to the study of language expressed in the MMORPG, *Lineage*. Influenced by research findings in functional linguistics (citing Clark, 1996; Gee, 1999; Halliday, 1978; Levinson 1983; Schiffrin, 1994), Steinkuehler (2006) interpreted the cognitive activity of players in the context of their interaction and communication. Steinkuehler's analysis of discourse expressed among members of the *Lineage* community, conceived as a culture-sharing group, involved an analysis of *Lineage* language (morphology and syntax) and patterns of *Lineage* practices (activities, interaction, and communication) that revealed shared goals, values, and identity construction among *Lineage* players. The study exemplifies a nuanced application of discourse analysis in the landscape of a globally networked society, where research traditions found in anthropology, sociology, and developmental psychology have converged in the socially responsive, scientific exploration of digital media artifacts. The extent to which game developers engage in rigorous sociological inquiry is unknown; however, the case

of *Lineage* shows that game developers had engineered in-game opportunities for the development of shared meaning and a sense of community as seen in player identity development (through role-playing) and in the development of shared goals and values (through communication, interaction, collaborative activity, and language use).

Dickey's (2007) work inadvertently highlighted game developers' awareness of player needs by emphasizing the potential influences of MMORPG character design and narrative environment on players' intrinsic motivation in a critical analysis of *World of Warcraft.* Based on a discursive analysis of players' communicative expression and response to multimedia, or multi-modal features of videogames, Dickey (2007) aimed to draw connections between game design features and player psychology, specifically the aspect of intrinsic motivation, as a way of generating practical knowledge that may inform instructional designers' approaches to the design of interactive learning environments.

Shaped by game developers' awareness of players' desires along with their own access to technological resources, the MMORPG is described as "a flexible design which allows players choice, collaboration, challenge, and achievement, while at the same time it is a design which provides scaffolding for players to progress and learn. The design of small quests in MMORPGs may provide a model of how to design learning tasks within an interactive learning environment" (Dickey, 2007, p. 263). Although the purpose of the MMORPG was "to entertain" and the purpose of instructional design was "to foster learning," Dickey (2007) suggested that both MMORPGs and interactive learning environments were designed to expose players to various forms of information, while intrinsically motivating them to use new knowledge to formulate future plans of action. Information about the potential impact of these design features on learners

was intended to provide useful fodder for instructional designers seeking to incorporate intrinsic motivation in designed learning environments.

In the context of game development, selections of previous research from the field of education (Dickey, 2007; Fields and Kafai, 2009; Steinkuehler, 2006) have shown that successful, sustainable MMOGs expose players to intrinsically motivational activities, which primarily involve acquiring and using knowledge to formulate and carry out future plans of action through inquiry, language use, communication, role play, identity development, and self-expression in the context of strategically designed adventures, or monomyths. The common nature of play within *Ultima Online*, *Whyville*, *Lineage*, and *World of Warcraft* demonstrates that game developers' of recent decades have developed a shared perspective and expertise about what appeals to player-consumers from a sociological, technological, and economic standpoint.

Conclusion

Based on this review of previous empirical research, user-generated wiki content, MMOGs that have sustained popularity and use over time (*Ultima Online*, *Whyville, Lineage,* and *World of Warcraft*), and an interview with a professional videogame producer, these trends were observed:

- online videogames were poised for sustainability in the global marketplace when they were continually shaped over time by communities of persistent innovation and play, including a diverse professional workforce and their direct experience with the target consumer audience
- drawn from the fields of anthropology and cognitive psychology, the meaning-making activities of inquiry, discovery, cooperation, apprenticeship, problem-solving, language use, and personal expression appeared as integral features of player activity in successful MMOGs, which highlights a shared perspective among game developers about what appeals to consumers (sociologically) and the (technological) platform capabilities needed (via adequate financial support) to facilitate in-game activities that appeal to consumers

Supported by these indications, I argue that communities engaged in the persistent innovation and play of online videogames are likely to sustain a durable trajectory of innovation within corporate contexts when they continually adapt to sociological, technological, and economic changes over time. Successful and well-designed online videogames, particularly massively multiplayer online (role playing) games, require a workforce that is able to engage in the practice of innovation with a persistent awareness of consumer, or player, needs (sociological awareness) and available resources (technological and economic awareness).

As this essay has explained, the sustainability of artifacts, including tools, services, environments, games, and digital media, is dependent upon the social awareness of its stakeholders, which could include engineers, financiers, analysts, executives, and producers. Collaborative innovation and inquiry were at the core of game development. In the case of sustainable online videogames emerging throughout the last twenty years, game developers' sociological, technological, and economic awareness has led them to design environments that have engaged players in the socially constructed, meaning-making activities of inquiry, discovery, cooperation, apprenticeship, problem-solving, language use, and personal expression. The implication of this finding is that these kinds of MMOGs present a unique opportunity for players to develop skills in the activities of inquiry, discovery, cooperation, mentor-apprenticeship, problem solving, language use, and personal expression.

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CHAPTER 3

LITERATURE REVIEW II: THE MAKING OF SERIOUS VIDEOGAMES[3]

[3] Garner, G. J. and R. M. Branch. To be submitted to *British Journal of Educational Technology*.

Abstract

This review of literature focuses on an interdisciplinary collection of lessons learned from previous empirical research that has addressed the process of designing and producing games for learning, or serious videogames. Empirical studies related to the production of serious videogames have been localized across several disciplines, including human-computer interaction, games, instructional design and development, anthropology, management and organization, new media, and literacy. Along with an analysis of the connections among findings in these areas of study, areas where further research could be pursued have been noted, and general research, design, and development guidelines for building serious videogames have been highlighted.

Introduction

Throughout the last three decades, curriculum designers, game developers, software engineers, and other experts in professions such as training, instructional media production, videogame design, and corporate entertainment have co-constructed games for learning. Instructional designers, game designers, and researchers with respective expertise in the design of learning, of play, and of social and scientific inquiry have explored and responded to the unique design problem found at the heart of the educational game, which is that the final product must be effective in achieving learning outcomes as well as enjoyable, meaningful play among players (Aldrich, 2005; Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005; Belloti, Berta, De Gloria, & Primavera, 2009; Chaffin & Barnes, 2010; Gee, 2005; Kafai, 2008; Squire, 2006). The values and activities of research and development teams that have created games with the intention of generating learning gains as well as enjoyment in play were analyzed from academic reports of the production process involved in constructing games for learning, educational games, and game-based learning environments, collectively referred to throughout this review as serious videogames (SVGs).

The phrase, serious videogames, has been selected to refer to digital game environments designed to entertain and to teach pedagogical concepts through play. The root subject, *videogame*, refers to an interactive digital environment in which users are exposed to an enjoyable and engaging experience of play. The added descriptor, *serious*, is a quality referring to a system in which users are expected to achieve learning gains through exposure to pedagogical content, such as geometry concepts or international conflict resolution tactics. The activity of play within a serious videogame is the catalyst for the following intended cause and effect: as the user plays the serious videogame, he or she is entertained and engaged, while

interpreting integrated pedagogical content and constructing new pedagogical content knowledge.

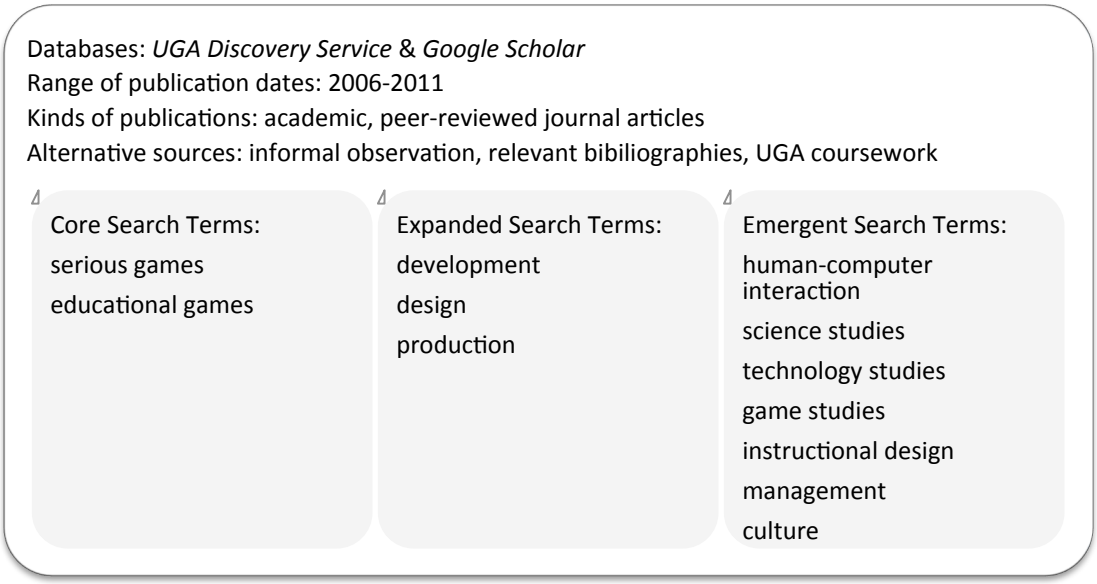
The purpose of this review was to present serious videogames in the context of design and development processes in which these unique forms of educational and entertainment media have been produced. First, the scope and methods used to collect and analyze the literature have been described. Next, previous empirical research describing research approaches and work involved in SVG production have been discussed and analyzed. Concluding remarks about discoveries found in the literature on SVG production and suggestions for future research have been included in the final sections of the review.

Scope of the review

Interdisciplinary, empirical studies that have addressed production teams and the work of producing serious videogames were reviewed. Literature that provided both ample and discrete descriptions of the work involved in producing SVGs was the focus of analysis. The reasons for surveying this literature were (a) to understand the nature of human influence in the SVG production process; (b) to identify influences that have shown some degree of potential for generating SVGs that expose children to learning content, cause them to achieve learning gains, and engage them in an enjoyable play experience; and (c) to explore the ways in which researchers have addressed SVG design work.

Peer-reviewed, scholarly publications were sought in the disciplines of instructional design and development, management and organizational studies, human-computer interaction, games, instructional design and development, anthropology, management and organization, new media, and literacy. Relevant sources, such as Raybourn (2007) and Sheridan and Hart-Davidson (2008), included literature that described the production process at some point between the

phases of preliminary needs analysis through implementation and evaluation. The search, selection, and analysis of relevant literature were based on search terms, limiters, search locations, and emergent data shown in Figure 1.



gure 1: Factors Influencing the Selection of Relevant Literature

The search filter included a combination of the core terms, *serious games* and *educational games*, with an expanded set of search terms, *development*, *design*, and *production*. The inquiry was further limited to academic peer-reviewed journal articles that reported empirical research findings, the production of SVGs (versus games that were neither educational, nor digital), and appeared within the time frame of the last five years between January 2006 and March 2011.

Initially, the *Google Scholar* database was examined for its capacity for comprehensive depth in identifying literature relevant to this particular search. After comparing similar searches between *Google Scholar* and the university database, *University of Georgia (UGA) Discovery*

Service, it was determined that *Google Scholar* would serve as an adequate resource for surface-level, contextually relevant data collection, but the *UGA Discovery Service* provided access to a significantly larger amount of work for a study of scholarly literature. In a search conducted on March 26, 2011, the combined search terms, *serious games*, *design*, and *human computer interaction* were entered into the *Google Scholar* and *UGA Discovery Service* databases. *Google Scholar* returned 341 results between 1980 and 2009, and the *UGA Discovery Service* returned 13,971 results. The *UGA Discovery Service* was selected as the primary search database for this literature review.

Bibliographies from relevant literature reviews and literature identified in syllabi from previous doctoral coursework at UGA were also collected as points of reference for identifying relevant search terms. Because the review was conducted as part of a two-year empirical investigation, the approach to searching, analyzing, and interpreting patterns was based on Glaser and Strauss's (1999) grounded theory methods for qualitative inquiry, which supported the effort to generate a comprehensive understanding of factors influencing SVG production. A core set of categories was identified through the use of constant comparative analysis in the context of Glaser and Strauss's (1999) grounded theory approach. The grounded method guided the researchers through the systematic discovery of relevance and relationships among empirical studies referring to SVG production and allowed for exploration of the substantive topic within a multi-disciplinary landscape of related domains, including management studies, organizational studies, instructional design, human-computer interaction, and game studies. Questions guiding this review and analysis were as follows:

1. What was the nature of human influence in the SVG production process?

2. Which influences have shown some degree of potential for generating SVGs that exposed children to learning content, caused them to achieve learning gains, and engaged them in an enjoyable play experience?
3. How have researchers approached the work involved in SVG production?

The value of reviewing previous empirical research through constant comparative analysis was the structure it provided in guiding the inductive discovery and synthesis of core attributes that characterized the context in which people produced serious videogames.

As a way of further verifying the relevance of emergent categories (human *values*, *activities*, and *tools*), conference proceedings, books, book chapters, and periodicals were identified as secondary sources of review, based on their relevance to *values*, *activities*, and *tools* described in the core set of selected texts. Comparisons based on these categories were examined across the core collection of literature, further verifying the relevance of both the emergent categories and the studies selected for review. As new categories were sought, categories that had already been recorded were refined, key words began to emerge, and these were methodically incorporated into the review as emergent search terms. The terms, *human-computer interaction*, *science studies*, *technology studies*, *game studies*, *instructional design*, *management*, and *culture*, generated relevant search results and helped to further refine and expand the search over time.

Review of previous research about the production of serious videogames (SVGs)

From the inspection of production activities and tools, it was found that the organizational values of productivity, educational effectiveness, and player enjoyment appeared most consistently in the activities and tools of production teams. Team members' values and their performance in production activities and tools were aspects of designers' and researcher-practitioners' work that affected both the process of production and the SVG produced. Reported in narrative descriptions of the work involved in SVG design and development, Klopfer and

Squire's (2008) production activities and tools, listed in the left column of Table 1, were codified, based on the extent to which the activity or tool showed were examples of designers' values of productivity.

Of seven activities and tools, five supported the value of productivity, six supported the value of educational effectiveness, and six supported the value of player enjoyment. For example, activity A1 shown in the first row of Table 1 explains that Klopfer and Squire (2008) used "specific platform architecture (augmented reality platform) to promote 'context sensitivity' and 'social interaction'," and activity A1 exhibited these values in *Environmental Detectives*:

1. The continued use of a specifically designed tool during development supported the value of productivity because it allowed for systematic design and development practices; and
2. The tool being used was designed to support context sensitivity and social interaction, which were features selected to improve educational effectiveness and player enjoyment.

Because its technical capabilities were customized to build games that attended to context sensitivity and social interaction, Klopfer and Squire's (2008) augmented reality platform was a technological tool that increased the likelihood of success in achieving the generalized values of educational effectiveness and player enjoyment in the design and development of *Environmental Detectives*.

Table 1 Values, Activities, and Tools that Facilitated SVG Production (Klopfer & Squire, 2008)

Activities (A) and tools (T)	Values		
A1: **use of specific platform architecture** (augmented reality platform) to promote "context sensitivity" and "social interaction"	PRO	EDU	FUN
A2: **on-going modification to platform architecture** (augmented reality platform) designed to promote "context sensitivity" & "social interaction"	PRO	EDU	FUN
A3: **application of phases** in which work activities were organized by defined stages of production, including brainstorm, design, development, field trial, classroom implementation, & platform design	PRO	EDU	FUN
A4: **rapid prototyping** procedures implemented during all stages of	PRO		

production			
A5: **collaborative creation and interaction** among experts in instructional media & education		EDU	FUN
A6: **qualitative field observation** of play tests (usability testing)		EDU	FUN
T1: **augmented reality platform**, used during all stages of production, especially development	PRO	EDU	FUN

Note 1. Bold text emphasizes key verbs and phrases indicating human influence on the SVG production process.

Note 2. The common core values found throughout all literature reviewed are represented by the acronyms, PRO (productivity), EDU (educational effectiveness), and FUN (player enjoyment).

Qualitative field observations facilitated during the play test process were perceived as a work activity that led to the improvement of contextual relevance in *Environmental Detectives*. In sum, values of context sensitivity and social interaction were integrated more fully through rigorous research inquiry, which became an influential part of this particular SVG production (Klopfer & Squire, 2008). The implementation of both purposeful and unanticipated production tools and activities heightened the educational effectiveness of the serious videogame. Also, the process became more productive, since field observation gave rise to a more comprehensive collection of issues. The implementation of meaningful modifications to the design of the final product suggested that lab-based usability tests were not a comprehensive way of evaluating SVG usability features.

Activities and tools associated with systematic processes, such as rapid prototyping and the operation of organized stages of production were evidence of the need for temporal efficiency, which was categorized as a feature of the core value of productivity. Klopfer and Squire (2008) emphasized the outcomes of rapid prototyping and phase integration as ones that facilitated a timely work rate and frequent evaluation to ensure the functional integrity and educational effectiveness of prototypes. From the standpoint of organizational management, the value of rapid prototyping and systematic process control in the production of *Environmental*

Detectives resulted in a combination of increases in productivity and product quality, especially with regard to its capacity for educational effectiveness.

Raybourn (2007) reported the applied value of "intercultural communication" in the design and use of Simulation Experience Design Method (SEDM). Simulation Experience Design Method was a conceptual tool designed to improve SVG quality by promoting the enhancement of both designers' and players' intercultural experiences and opportunities for communication. Shown in Figure 2, Raybourn (2007) interpreted design tasks as an iterative cycle in which designers created interactions that gave rise to culture within the game, leading to the creation of new interactions and the continued emergence of culture.

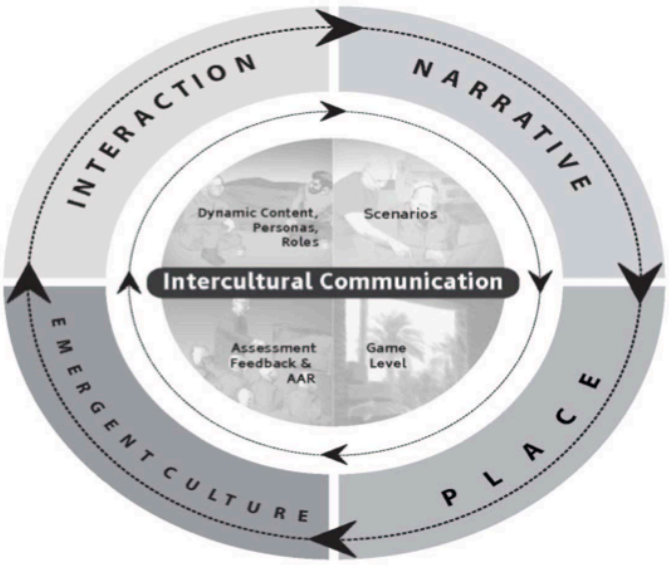


Figure 2 Raybourn's (2007) Depiction of Simulation Experience Design Method (SEDM)

Based on an analysis of Raybourn's (2007; 2008) description of designers' SEDM-inspired activities and the outcomes of these activities that were observed during pilot study, it appeared that the aim of Raybourn's (2007; 2008) trajectory of research was to achieve

productive collaboration among diverse stakeholders during production, learning gains among diverse learners, and enjoyment in play among diverse players.

As a conceptual tool, SEDM promoted the "core value" intercultural communication by influencing the orientation of designers' awareness. Player diversity, for example, was interpreted as an integral feature of the game that reinforced and strengthened the operation of intercultural communication, rather serving as a "design liability" that required superficial resolution among designers (Raybourn, 2008, p. 5). Derived from Raybourn's (2007) description of the SEDM model, Table 2 has presented the SEDM-inspired activities designers engaged in to integrate the reported design value of intercultural experience and communication in SVG *interaction*, *narrative*, *place*, and *emergent culture*. In the left column, designers' activities and tools have been listed, and to the right, the core values represented in each of these activities and tools have been indicated.

Table 2 Values, Activities, and Tools that Facilitated SVG Production (Raybourn, 2007)

Activities (A) and tools (T)	Values		
A1: purposeful **use of conceptual tool** (SEDM) as point of reference for promoting (a) creation of SVGs that feature core value of "intercultural communication" and (b) productive interaction & communication within design team	PRO	EDU	FUN
A2: during "Interaction" design phase, designers identify with specific, imagined persona/role & **create interaction with this persona in mind** as a way of **adopting player perspective** to **promote enriched role development and enhanced game play**		EDU	FUN
A3: when designing "Narrative" interaction component, designers **create scenarios that compel players to** take on actions which **challenge personal assumptions & create dissonance or conflict** among other players		EDU	FUN
A4: during level design, designers' **careful research** of relevant real-world "Place" is regarded as core source of inspiration for culture-specific audio cues & artifacts used in role play, which directly affects players' sense of "Place" in SVG environment		EDU	FUN
A5: influencing design of "Narrative" and players' sense of "Place," designers **must encourage players (through narrative) to** play in ways		EDU	FUN

that simulate what they might normally do in real life (drive vehicles, exchange objects, see the physical consequences of actions)			
A6: designers support metagame activities by **designing learner discovery experiences for players before, during, between, and after game play**; led Raybourn (2007) to **the design of a systematic feedback loop**, involving real-time, in-game feedback that "updated one's understanding and subsequent contribution to the emergent culture" of the game		EDU	FUN
A7: **collaborative creation and interaction** among diverse stakeholders (Raybourn, 2008)		EDU	FUN
T1: Simulation Experience Design Method (SEDM), used during all phases of production, especially design, **as a conceptual point of reference for promoting design** of SVGs that featured core value of intercultural communication	PRO	EDU	FUN

Note 1. Bold text emphasizes key verbs and phrases indicating human influence on the SVG production process.

Note 2. The common core values found throughout all literature reviewed are represented by the acronyms, PRO (productivity), EDU (educational effectiveness), and FUN (player enjoyment).

Activity A2 from Table 2 explains, "During 'Interaction' design phase, designers identify with specific, imagined persona/role & create interaction with this persona in mind as a way of adopting player perspective to promote enriched role development and enhanced game play." Guided by the SEDM, designers have been encouraged to develop an awareness of the ways in which diversity in players' personal backgrounds, prior experiences, and cultural affiliations influence the design of SVG interaction, narrative, place, and cultural emergence for the sake of achieving the explicitly stated design criteria of intercultural communication.

In addition to ensuring specific outcomes among players, Raybourn (2007, 2008) recommended the SEDM for use as a frame of reference that would steer designers toward shared understanding among design team members and effective evaluation by helping to mediate conflict among team members. Raybourn (2008) explained, "as we strive to create engaging serious games, differing cultural values of designers, developers, stakeholders, and players create

a myriad of complications and competing desires or expectations" (p. 5). Given that the SEDM has been presented as a strategy for addressing the "myriad of complications and competing desires or expectations" that arose from SVG production, a deeper analysis of the way in which these human components were addressed by the SEDM was needed.

Preliminary evidence showing the educational effectiveness, usability, and other outcomes of SVGs created with the use of SEDM was drawn from players' personal reports and focus group interviews, which elicited perceptions and attitudes about experiences of play in the game (Raybourn, 2007). Of 51 players, the majority reported "being engaged with realistic scenarios that were grounded by credible experiences and they reported that they believed they learned more about their strengths and weaknesses by participating in the game than they would have learned had they not participated" (Raybourn, 2008, p. 4). Although it was beyond the scope of the investigation (Raybourn, 2007; 2008), Raybourn (2008) reported a plan to address, in future research, the extent to which applying SEDM to the design process facilitated the creation of SVG environments that fostered intercultural discovery, emergent culture, and learning gains.

Generally, SVG platform architectures and conceptual design tools were not evaluated for the degree to which they systematically steered production teams toward achieving value-based objectives. However, the application of these tools in SVG production lends weight to the emergent finding that organizational values emerging from purposefully designed and applied tools directly influenced the work of production teams.

Further defining the values of productivity, educational effectiveness, and player enjoyment, Moreno-Ger et al. (2008) designed, developed, and implemented a game engine, called *e-Adventure*, to support a diverse audience of online instructors involved in designing,

integrating, and delivering pedagogical content in the context of learning management systems. Moreno-Ger et al. (2008) argued that innovation in the design, development, and integration of SVGs in school classrooms has been limited by technical platforms that catered to specific infrastructure requirements of either instructional media or videogames, rather than the requirements of both. In contexts where media needed to be implemented as part of established curricula, SVGs fell short for a few reasons, including these (Moreno-Ger et al., 2008):

1. End-user course instructors did not have the technical skills to modify features of the SVGs to suit the needs of their learners and specifically defined curricula;
2. Creation or adaptation of SVGs often required advanced game programming which was costly; and
3. Players' experience of SVGs often resulted in extreme ranges of outcomes with players enjoying games that were not adequately educational or becoming bored with sufficiently educational games that were not adequately entertaining.

e-Adventure was created to account for specific issues related to the values of productivity (professional diversity of designers, diversity of content, and cost effectiveness), educational effectiveness (pedagogical integrity), and player enjoyment (entertainment value).

With *e-Adventure*, designers and end user instructors could repurpose digital media to fit learner needs in SVG environments, including embedding individual assessments within the game and operating within a standard learning management system (LMS). The "game-based learning object" platform like that of *e-Adventure* was designed instructors the ability to deliver SVGs online, manipulate basic features to suit pedagogical needs, and apply contextually relevant assessment and interaction strategies in the context of a learning management system.

While the approach directly addressed realistic and relevant needs, its scope was limited to technological infrastructure. The design of the *e-Adventure* platform began with the production team's purposeful selection of what designers perceived as an appropriate game type, a point-and-click adventure game. Because point-and-click adventure games promoted the

entertaining concept of adventure and allowed for embedded assessment, pedagogical integrity and entertainment value were satisfied by the technological capabilities of *e-Adventure*. The design, development, and implementation of *e-Adventure* were experimental steps toward industrialization of the process for building serious videogames. In addition to selecting the genre and building the architecture to support it, the game concept and narrative had to be imagined and articulated by designers. The values of productivity, educational effectiveness, and player enjoyment in the production and design of *e-Adventure* were fully realized with writers' development of "a compelling story" (Moreno-Ger et al., 2008, p. 9).

de Freitas and Oliver (2006) analyzed iterative evaluation cycles in the SVG design process, questioning how exploratory learning was most effectively evaluated in the creation of a medical training game. Over time, effectiveness in evaluating exploratory learning increased (Jarvis & de Freitas, 2009). Through continued experimental inquiry and the evaluation of educational efficacy, Jarvis and de Freitas (2009) found that feedback mechanisms embedded in SVGs directly addressed learner needs and affected their learning outcomes. The comparison of learning outcomes from learners' play of a computer-based game with those from learners' engagement in live, hands-on practices showed that participants who played the SVGs were more accurate in performing trained tasks than those that worked in the live setting (Jarvis & de Freitas, 2009). Jarvis and de Freitas (2009) reported that future work would aim to determine which feedback mechanisms were most effective in supporting learner' needs and learner outcomes. Persistent empirical study improved the design features of SVGs over time.

Just as Klopfer and Squire's (2008) iterative research agenda, especially the use of field observations, improved the development procedures and contextual relevance of the game, Jarvis and de Freitas's (2009) iterative research agenda increased the educational effectiveness of the

medical training game in its ability to produce better learning outcomes than hands-on training. By integrating the critical comparative practice of science inquiry, researchers improved the quality of educational effectiveness.

With the support of experimental tool design and implementation, multi-disciplinary foundations of expertise were needed to produce SVGs (Gunter, Kenny, & Vick, 2008; Klopfer & Squire, 2008; Moreno-Ger et al., 2008; Raybourn, 2007). Gunter, Kenny, and Vick (2008) characterized the production of SVGs as a collaborative effort among instructional designers, videogame designers, and software developers. In interviews with members of an SVG production team, they found that frequent misinterpretation among instructional designers and game designers contributed to the need for a method of production that supported professional diversity and promoted cohesion among diverse team members. The researcher-practitioners qualitatively evaluated the professional terminology used by both groups and developed the Relevance Embedding, Translation, Adaptation, Immersion, & Naturalization (RETAIN) rubric. The RETAIN rubric was intended for use during design and evaluation stages in SVG production as a common point of reference, helping to mediate diverse interpretations of meaning.

As a functional affordance, the creation of the RETAIN rubric was evidence of the implications that (a) instructional designers, game designers, and researchers were involved in the making of SVGs, and (b) the production process could be influenced through the application of qualitative interview strategies and responsive adaptation. However, the use of the empirically grounded RETAIN rubric in practice has not been reported since its publication in 2008, which leaves in question the degree of involvement that researcher-practitioners had in the making of SVGs and the practical influence of scientific inquiry and the RETAIN rubric.

Thus far, two categories of tools have been described, including architectural development tools and conceptual tools. Table 3 presents an overview of these tool types, which were derived from the work of Klopfer and Squire (2008), Moreno-Ger at al. (2008), Raybourn (2007), and Gunter, Kenny, and Vick (2008).

Table 3 Overview of Tools that Facilitated SVG Production

Tool	Purpose	Reported features and effects of the tool in SVG production
augmented reality platform (Klopfer & Squire, 2008)	architectural development tool for SVG software developers	(a) allowed for easier technical integration of design values ("context sensitivity" and "social interaction") into SVG (b) favored designs that supported "context sensitivity" and "social interaction" as foundation for learning (c) favored designs that supported "context sensitivity" and "social interaction" as foundation for meaningful play (player enjoyment)
game-based learning object (Moreno-Ger et al., 2008)	architectural development tool for end-user instructors, post-delivery	(a) supported diversity of designers, allowed for diversity of content, & supported limited budget (productivity) (b) favored game genres that supported pedagogical integrity & could be supported by LMS (c) favored game genres most likely to entertain (player enjoyment)
Simulation Experience Design Method (Raybourn, 2007)	conceptual frame of reference for designers during design & evaluation	(a) promoted productive interaction & communication among diverse stakeholders (productivity) (b) promoted design that featured core value of "intercultural communication" as foundation for learning (c) promoted design that featured core value of "intercultural communication" as foundation for meaningful play
Relevance Embedding, Translation, Adaptation, Immersion, & Naturalization (RETAIN) rubric (Gunter, Kenny, & Vick, 2008)	conceptual frame of reference for designers during design & evaluation	(a) promoted clear communication among diverse designers (b) professional language and rating system of the rubric accounted for values and considerations of instructional designers, which supported SVGs' capacity for learning in game play (c) professional language and rating system accounted for values and considerations of game designers, which supported SVGs' capacity for sustained entertainment in game play

Architectural development tools included the augmented reality platform and game-based learning object, which were created for and modified in the making of Environmental Detectives and e-Adventure, respectively. Simulation Experience Design Method and the RETAIN rubric were conceptual tools created in response to conflict emerging from designer interaction and the complexity of SVG design requirements (Raybourn, 2004, 2007, 2008; Gunter, Kenny, and Vick, 2008). The lettered list of observable effects in the third column of Table 3 represents each of the conceptual and architectural development tools that led to (a) productivity, (b) educational effectiveness, and (c) player enjoyment.

Each of these tools appeared to support the three common values, and the greatest consistency found across the literature was that educational effectiveness appeared most frequently as a value embedded in the activities and tools of SVG production. The Game Object Model II (GOM II), for example, was Amory's (2007) response to the perceived problem that SVG production teams did not have a cohesive way of evaluating the pedagogical integrity of their games. By providing teams with a checklist of pedagogical considerations developed and organized on the basis of previous research about the delivery of instructional media, Amory's (2007) aim was to systematically improve the educational effectiveness of SVGs by incorporating the use of GOM II into the design and evaluation phases of production. Unfortunately, experimentation with the use of GOM II in the practice of production has not been reported to date. Nevertheless, the incorporation of functional artifacts, such as tools, templates, and checklists, during design and evaluation phases of SVG production were a common recommendation and response to the problem of ensuring educational effectiveness in SVG design.

Discussion

The questions that guided this review and analysis were as follows: (a) what has been the nature of designers' influence in the SVG production process?; (b) which influences have shown some degree of potential for generating SVGs that expose children to learning content, cause them to achieve learning gains, and engage them in an enjoyable play experience?; and (c) how have researchers approached the work involved in SVG production?

Designers' influence in the SVG production process

Unlike other forms of digital media, including videogames and instructional media, the most common purpose for employing designers in SVG creation was to engage users in learning through meaningful play in an interactive videogame environment. The activities and tools that designers used to achieve optimal conditions for generating learning gains through SVG play appeared in qualitative narratives about collaborative interaction, design, and evaluation, which were work activities shared among game designers, instructional designers, and researcher-practitioners. Information about team roles, responsibilities, and management activities were understood more fully through reports of research methods, and in most cases, researcher-practitioners participated in the SVG production process. Activities involving collaborative creation and interaction among experts in instructional media and/or education supported the assurance of quality in educational efficacy and player "satisfaction" (Sheridan & Hart-Davidson, 2008; Klopfer & Squire, 2008).

For example, Klopfer and Squires' (2008) work suggested that design teams should attend to learner needs during multiple iterations of formative evaluation phases that involved field observation of children at play, along with usability tests. Their description of research methods was highlighted as an activity they used to achieve optimal conditions for producing the SVG, *Environmental Detectives*. In Jarvis and de Freitas' (2009) work, experimental testing and

comparative analysis of test scores between learners trained through the SVG and those trained through hands-on practice led to the visibility of SVG play outcomes and adaptations that influenced players' learning gains. Inquiry among researchers typically supported the values of productivity, educational effectiveness, and player enjoyment in SVG production.

While collaborative interaction appeared in every study of SVG production, its value was not explicitly stated in the literature reviewed. However, research in instructional design and game design has confirmed the persistent requirement of teamwork in systematic design and development processes. From the field of instructional design, for example, Roytek (2010) found that design work and the learning products produced were dependent upon situational variability, such as fluctuations of available resources, technical limitations, or emergent deficiencies in the skills and work ethic of team members (Abdous & He, 2008; Reeves, 2006; O'Donnell, 2008). During videogame production, the team has been responsible for imagining, communicating, developing, inspecting, and adapting design concepts (O'Donnell, 2008; Salen & Zimmerman, 2005; Schell, 2008). The workflow of the Scrum framework for software development, for example, has begun with highly skilled design teams and a vision of the product under development (Schwaber, 2004). In addition, Schell (2008) posited that of all skills, the ability to listen was perceived as the most crucial skill in the production of good games (p. 4).

Like the design of instruction, games, and other software, SVG design and development has been collaborative in nature. The uniqueness of this form of digital media lies partially in the diversity of collaborating team members. The authors were unable to discover studies that explained the extent to which the employment of professionally diverse team members was necessary in SVG production; however, specific designer influences, including performance of practice and use of tools, showed a great degree of potential for generating SVGs that exposed

players to learning content, caused them to achieve learning gains, and engaged them in an enjoyable play experience.

Production activities and tools that exposed players to learning content, caused them to achieve learning gains, and engaged them in an enjoyable play experience

Rapid prototyping, collaborative creation, interaction among experts, field observation, experimentation, and the use of tools were activities that led to the achievement of educational effectiveness in serious videogames. Player enjoyment in SVGs was supported in production contexts that allowed for collaborative creation and interaction among experts, field observation, and the use of technical and conceptual tools designed to steer developers toward defined values.

Researchers approach to SVG production

Through their creation, adaptation, and reporting of tools (Klopfer & Squire, 2008), templates, checklists (Amory, 2007), and rubrics (Gunter, Kenny, & Vick, 2008) researchers' practice of science materialized in theoretical and practical contributions that were designed to support the core values of productivity, educational effectiveness, and player enjoyment through the practice of SVG production. Most inquiries were qualitative in nature, which led to narrative descriptions of process and patterns throughout SVG production. Along with ethnographic and experimental studies, design-based studies of *Quest Atlantis* (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005), *Environmental Detectives* (Klopfer & Squire, 2008), and *Levee Patroller* (Harteveld, Guimaraes, Mayer, & Bidarra, 2010) appeared theoretically bound to interpret, analyze, and report connections between design decisions or activities and outcomes that both facilitated and inhibited effective SVG design. These qualitative research approaches were effective in identifying causes of success and failure in cases of SVG production. More specifically, studies that reported relationships between design issues, strategies for addressing

design issues employed in practice, and the influence of these strategies on the production process and final product were and will continue to be informative resources for design practitioners and researchers alike.

Conclusion

The consistent emergence of the values of productivity, educational effectiveness, and player enjoyment supported the observation that SVG production teams have strategically explored, defined, integrated, and adapted unique activities and tools so that specific values were reinforced in production. SVG production appeared to be guided by designers' shared values of productivity, educational effectiveness, and player enjoyment, and activities and tools that facilitated the production of SVGs and led to outcomes that reinforced these values.

Based on this inquiry of the human components of production, knowledge of professional culture in SVG production was discernible. From researchers' narrative descriptions of activities and tools that facilitated SVG production, professionally oriented values related to SVG production, prototypes, and quality included heightened productivity, educational effectiveness, and player enjoyment.

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CHAPTER 4

AT THE TABLE: A STORY OF APPRENTICESHIP IN THE CROSS-SECTION OF EDUCATION, DESIGN, AND DIGITAL MEDIA[4]

[4] Garner, G. J. To be submitted to *Qualitative Inquiry*.

Abstract

The purpose of this essay is to show the ways in which ethnographic and grounded theory practices provided a useful means for investigating the organizational culture of an emergent production system. With neither expertise in videogame design nor software programming, the researcher gained access to the unit of analysis, the production of serious videogames, as a research and instructional design apprentice. The chapter chronicles the experience of sociological inquiry in the context of a highly complex design and development process.

Introduction

This essay aims to present the lived experience of conducting academic research as an instructional design apprentice within an organization of innovation. The production of serious videogames was investigated as part of my dissertation research in fulfillment of the requirements for obtaining a Ph. D in Learning, Design, and Technology. The methods for engaging in academic inquiry within the context of both the private media industry and a public university were both inadvertently and strategically shaped by legal, technological, sociological, and economic forces. In the context of an organization, a business entity, and a team, collectively referred to as Vision Launch, legal restriction, technological mediation, geography, financial need, team diversity, and attitude were several forces that constrained and enabled the practices of ethnographic fieldwork and grounded theory development.

For example, a leading company[5] and public research university's college of education[6] governed the confidentiality of identity and intellectual property among stakeholders associated with and involved in the organizational growth and development of Vision Launch.

Administered through the IRB process of ethical review, the university regulated the safety and confidentiality of 22 participants (Institutional Review Board Services, n.d). In the case of non-compliance with the IRB-approved research agreement, a range of indefinite consequences could have been suffered, such as termination of research by the IRB or suspension of employment by the university. On the part of the company, approval to work with

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[5] Records from the CNN Money website showed that for over a decade, the company comfortably secured an annual rank in the top one hundred public corporations of the Fortune 500 list of Fortune magazine, which is based on gross revenue after taxes (CNN, n. d.)

[6] Records from the 2011 U.S. News & World Report showed that the university's college of education ranked in the top fifty education programs across the United States, which is based on the average amount of externally funded research expenditure per faculty member and the total amount of externally funded research conducted by the school (U.S. News & World Report, n. d.)

the production team and study Vision Launch's production process was regulated by a carefully designed Non-Disclosure Agreement (NDA), which enforced the threat of socioeconomic warfare against any employee who jeopardized the sanctity of a corporation's intellectual property (IP).

In the work and publication of this study, a signed NDA was documented acceptance of these respective risks and rewards: 1. Upon completing two years of fieldwork, data collection, and analysis, the company could have demanded the non-disclosure of knowledge produced for the publication of this doctoral dissertation; and 2. Throughout the two years of fieldwork, data collection, and analysis, the company would grant tuition reimbursement, a monthly stipend, and the opportunity to participate in and study Vision Launch's live process for building a collection of serious videogames. The highly sensitive nature of the NDA affected this study in two important ways: 1. Great care was taken to honor both the practice of science and the boundaries of the NDA; and 2. I, the novice anthropologist and instructional design apprentice, gained privileged access to a rare seat at the table with carefully selected professionals from the industries of academia and game development.

This essay presents the socially, technologically, legally, geographically, and economically constructed practice of academic inquiry conducted during and with a production team's collaborative creation of a collection of serious videogames, produced for Vision Launch and a client MMOG, referred to as PlayWorld. The goal of the dissertation study was to target the influence of human social culture within the Vision Launch production system. The purposes of the study were to (a) generate a holistic understanding of culture shared among team members, who were employed in the making of digital, education-based games, (b) explore relationships between shared culture, the production process, and games that were produced, and

(c) use these data to guide the development of theory about enterprises, or systems, of innovation, specifically those that produce digital, education-based games, referred to in this essay as serious videogames (SVGs).

Background

The making of serious videogames was a communal effort among corporate executives, producers, engineers, designers, apprentices, and professors. When I joined the education group as an instructional design (ID) apprentice in May 2009, members from three separate regions of the United States had been working together for an average of 8-9 months. Preliminary observations of the education group's work indicated that team members appeared to share similar beliefs about the potential for achieving learning outcomes through game play.

The SME project manager, strategy consultant, and education director explained in informal conversations that, "if designed well," videogames would be effective environments for learning. In individual interviews, several curriculum Subject Matter Experts (SMEs) reported uncertainty about the scope of their involvement in the process during the early stages of production. However, all SMEs reported unanimous support for the Vision Launch mission.

In fact, the influence of the Vision Launch mission on the production team's inclusion criteria for SMEs was visible very early on in its organizational development. The SME project manager reported that in one of the education group's first meetings with Vision Launch executives during Fall 2008, one SME had expressed such a great degree of disagreement in his support for the integration of pedagogy in game environments that he eventually left the team.

The project manager's testimony was preliminary evidence of three possibilities: 1. Behavior and beliefs could be expressed and observed in team meetings; 2. The adamant rejection of Vision Launch's core values was grounds for exclusion from the Vision Launch

system; 3. The Vision Launch mission, core values, and beliefs were sources of guidance in the management of production; and 4. The Vision Launch system favored cooperative collaboration among team members.

Table 4 shares a reflective memo that describes a field experience in which behaviors and beliefs among members of the education group were directly expressed through collaborative work, which was a fundamental activity in the making of serious videogames. During my first field experience "at the table" with the education group, the enthusiasm expressed during the presentation of the team's first prototype video was a clear indication that most SMEs were supportive of the Vision Launch mission. In the months that followed this meeting, I assisted SMEs and the SME Project Manager in their revision of the curriculum as an instructional design assistant. As a scientist, I observed, listened, wrote field notes, and critically reflected on the process, people, and interaction in which I was participating.

Table 4 Memo About the Experience of Entering the Field

Critical reflection about the researcher's first experience in the field
I entered the scene in May 2009. At this time, the Vision Launch education group was convening in the cozy privacy of its newly acquired meeting place. Also in attendance, the Education Director and one of two strategy consultants traveled over two thousand miles to lead this meeting in which they reported production updates and issued a plan of action for the coming months. Seated at a conference table among twelve subject matter experts (SMEs), I watched as the Education Director and strategy consultants unveiled the organization's first serious videogame prototype. Sounds and expressions of excitement and awe filled the room with enthusiasm as the team reveled in the achievement that most appeared proud to share with each other. The game had been created over the course of the previous twelve months of work between members of the education group from Site A, Vision Launch executives from Site B, strategy consultants from Site C, and an external game development company that specialized in producing high-end ("Triple A") videogame titles.

> The collaborating groups had successfully completed the task of creating a prototype that positively reflected Vision Launch's potential for producing videogames capable of exposing elementary level players to pedagogical content in a fun, meaningful, and, as the Mathematics SME remarked, "beautiful" game world.
>
> After this portion of the presentation, the education director outlined upcoming plans, expectations, and assignments for the education group. Building on eight months of prior work, SMEs would continue revising the content and organization of content for six domains of the curriculum map, including elementary level (K-5) Science, Social Studies, Mathematics, Language Arts, Music, and Art. [Proprietary text deleted from passage.]
>
> Analytic reflection: The current of applause and joyful commentary among SMEs was an overt emotional indication of the education group's collective sense of satisfaction, and admiration. With the powerful compliment of highly developed prototype imagery, the strategy consultant and education director clarified the project scope and reemphasized the team's mission through live, face-to-face dialogue and an impressive presentation of achievement.
>
> Confirmed in follow-up conversations with the SME project manager and in interviews with meeting participants, the combination of audiovisual presentation of scope and mission, face-to-face dialogue, and the positive nature of the news reported appeared to foster the collective sense of enthusiasm and understanding among members of the education group.

The process of collaboratively revising and calibrating each of the six curriculum domains lasted from that summer, May 2009, through the following summer, August 2010. As a result of the changes in scope, organization, language, and visual of the curriculum map grew from six lists of pedagogical concepts into an intricately detailed web of K-5 educational content. In an interview, the Education Director reported that the map was considered a "living document," subject to systematic rounds of revision over time.

Collaborative work between the education group and team members from Sites B and C occurred more frequently as Vision Launch's Game Development Group became primed for internal production. Between May 2010 and May 2011, through a series of 23 two-week rapid production cycles, or roughly one year of collaborative work between May 2010 and 2011, the

team's publication record increased from 0 to 11, which is a testament to Vision Launch's growth in production capacity.

In the next section, the methodological approach used to study organizational culture in the operation and development of the Vision Launch production system is delineated. A blended application of ethnography and grounded theory methodologies directed the mangled practice of fieldwork and discovery in my work with the Vision Launch production team between May 2009 and 2011.

Methodology

The qualitative approaches of ethnography and grounded theory were used to guide the collection and analysis of perspectives, activities, and interaction observed in Vision Launch's evolving infrastructure of production. During the first year of research, I explored the field of study with the goal of understanding patterns of perspective, activities, and interaction in various workspaces. The influence of culture on the process for producing serious videogames was the central focus. The benefit of an ethnographic approach to data collection was that because its methodology aims to generate holistic knowledge of the operation of cultures in production, areas of specific interest could be more easily identified. As a result, a sub-set of research questions emerged, which strategically targeted the causal influences of "culture" in the production of serious videogames.

Research questions

The main research question guiding the study was, in what ways does culture influence the work of serious videogame production? The following sub-questions were posed:

(1) How do design team members define their individual roles, responsibilities, activities, experiences and contributions?

(2) In what ways have these realities (roles, responsibilities, activities, experiences and contributions) influenced the production of serious videogames?

(3) What types of affordances have surfaced as a result of team collaboration and interaction within the context of the team's participation in serious videogame design practices?

(4) How does the team mediate differences in personal worldview and perspective as they arise through various activities, such as the resolution of design problems?

Data sources

The following categories of activity created knowledge, emergent themes, and empirically grounded theory about the cultural system of building serious videogames:

- content analysis: selecting relevant multimedia from the Game Development Group's online blog or writing an analytic memo about a field experience
- spatial mapping: drawing images of sites or meeting arrangements, using OmniGraffle software or a pencil and paper
- multimedia review: searching for previous empirical records or observing online activity outside of the production context
- *observation*: audio recording a meeting or watching the team interact with a purposeful blend of focus and openness
- *elicitation*: informal conversation via email or formal interviewing
- *participation*: work and relationship building as a team member

Table 5 lists each form of data that was collected through these activities and identifies the research questions that each form of data addressed most directly. Core data sources included interview transcripts, internal documentation, meeting records, and observation records.

Table 5 Alignment Between Data Sources and Research Questions

Data sources	Research questions			
25 interviews	1	2	3	4
Internal documentation				
300+ email conversations	1	2	3	4
Digital prototypes		2	3	
Images		2	3	
Video recordings		2	3	
PowerPoint presentations (3)		2	3	
Meeting records				
Video recordings (3)	1	2	3	
Audio recording (1)	1	2	3	4
Agenda documents (4)		2	3	
PowerPoint presentations (3)		2	3	
Observation records				
Field notes	1	2	3	4
Research memos	1	2	3	4
Photographs		2	3	
Audio recordings	1			4
Sketches	1	2		

Production team and workspaces

In the context of the production system, the informants were people who participated in Vision Launch production. Relevant field spaces included those in which production-related work took place. Site A, located on the western U.S. coast, is the Vision Launch corporate headquarters. It was also the collaborative work and meeting space for the game development group, which included the executive producer, internal game development lead, 3 artist-designers, 1 network engineer, 5 engineer-designers, and the education director.

Site C, located in the south-central region of the U.S., was the collaborative work and meeting space for the system engineers. These team members included 1 strategy consultant, 1 system architect, 5 engineers, 1 project manager, and 1 instructional designer. Site B, located on the eastern U.S. coast, was the collaborative work and meeting space for the majority of the education group members. Figure 7 presents an organizational diagram of the production team. The informants who participated in individual interviews have been highlighted in red, and my role as participant observer has been highlighted in blue.

The education group included the Vision Launch education director, strategy consultant, the SME project manager, 13 curriculum SMEs, 2 game SMEs, 2 research apprentices, and 1 instructional design apprentice. The education director was "internal" to, or a full time permanent employee of, Vision Launch. This informant was physically located at the corporate headquarters, Site A. The strategy consultant, 21st Century Skills SME, and Music SME 2 were located remotely in relationship to Sites A, B, C, and D. Like all team members, remote team members participated through travel, email, telephone, or videoconference.

The mangle of ethnographic fieldwork

Breglia (2009) has explained that the conventional and functional goal of ethnographic fieldwork (Malinowski, 1961) is to attempt to understand the "native" point of view through extensive participant observation, engagement in language and practice, extensive formal and informal interviews, creation of data, development and translation of a holistic sense of lifestyle, and a representation of this holistic sense as a model for comparison (p. 131). Aligned with a traditional ethnographic approach, field observations from the production team's work space and the formal and informal reflections of informants formed the basis of analysis during the first year of study (Geertz, 1973). Perspectives of the production team, "including beliefs and values

that underlie and organize their activities and utterances," emerged from a diverse collection of data, and they were comparatively analyzed for patterns of similarity and difference among all informants (Ochs & Schieffelin, 2001).

One key observation was that groups of informants who participated in the Vision Launch production process were accustomed to working within specific kinds of professional cultures. The Vision Launch production system appeared to present varying extremes of familiarity within the professionally diverse group of informants. With the methodological obligation "to ask how changes in one part of a social system affect other parts" (Fischer, 2007, p. 18), the core research question was expanded so that it directly addressed the ways in which the diversity of professional culture influenced the process of production.

Since the aim of ethnographic method within the context of this production system was to generate a holistic cultural portrait (Creswell, 2007), the challenge of this approach was reconciling the requirement of delivering a holistic interpretation of culture with the researcher's sense of social responsibility to learn and report practical information as a way of helping to improve the work of other production teams that build serious videogames. Though the granular details of an ethnographic portrait may not be of great importance to a design practitioner, data from this study has been analyzed, categorized, and coded based on its relevance to the research questions, which targeted the influence of culture on the production process.

In Breglia's (2009) description of anthropological research, the researcher characterized ethnographic fieldwork as an "invisible" activity when compared to what has historically been considered "more rigorous" scientific inquiry, such as archaeological studies or investigations of medical treatment. In the field activity of participant observation, for example, the traditional ethnographic researcher watches, listens, and often downplays the intrusive role as researcher in

the effort to build relationships of trust with group members with the aim of learning more truthful knowledge about the group's culture.

In meetings with the education group at Site A, fieldwork practices, such as note taking or asking for clarification of meaning, was easy to hide during sessions of traditional participant observation, since part of my role as an apprentice involved keeping detailed notes about meeting activities and discussions. While I was fully aware of my strategic observation methods, it was not always obvious to teammates that I was actually working, given the typical "concealment and agreed misrecognition of ethnographic labor" (Breglia, 2009, p. 133). At times, I became so involved in my work as a participant that, after reflecting upon these experiences, it was as though my role as an observer subconsciously faded into the background, rather than being deliberately concealed or ignored. Team meetings, for example, were a common form of organized, interactive work within the Vision Launch system, and within these frames of communication, performance, time, and space, my work as an apprentice involved activities, including but not limited to recording meeting notes and assisting SMEs and the SME project manager in the completion of their tasks for Vision Launch. My work as an apprentice at Site A seemed to fit naturally with my work as a researcher.

Alternatively, fieldwork conducted at the Vision Launch headquarters, Site C, required a semi-structured approach, complimented with the standard off-campus, remote, and informal interaction among informants. Table 6 presents a situation in which I made the decision to *forego* concealing and downplaying my role as a researcher.

Table 6 Memo About the Arrival to Site C

Description of the new Vision Launch office space
The Instructional Designer and I signed in at the front desk of the company at 8:30am. The Instructional Designer called the Vision Launch office, and a few minutes later, Game Artist 1 appeared, inviting us to join her in the elevator. Upon arriving on the private,

security enabled floor, Game Artist 1 showed us the location of the restroom and other areas of the floor that would require the swipe of a security badge.

As we passed through the colorful hallways, a large cubicle space appeared and we proceeded to the far left corner of the room, away from the entrance. We were greeted by the Education Director, who led us roughly 20 steps from her private office space, past the Executive Producer's private office space, and down a short corridor to the main game development office. The Game Development Lead and Executive Producer appeared independently walking back and forth between the game development office and other areas of the floor.

Game Engineer 1 had been working in the office since 6:30am, two of the artists had arrived at around 8am, and the remaining artists, and engineers trickled into the small office space at around 8:45am. Upon arriving late to the daily 9am scrum meeting, one engineer dropped to the floor and began doing push-ups, which was penalty that the team agreed to enforce upon themselves in cases of late arrival.

Team members were stationed next to each other in a semi-square arrangement, facing the walls. The Instructional Designer placed her bags next to the meeting table at the center of the room, and I did the same, trying my best to blend in with the scenery and team. This proved difficult, given that I was relatively unfamiliar to the development team, and I was seated in the center of the room.

Critical reflection: Reinforced by the security features of the building itself, I felt a heightened awareness of the need for confidentiality and privileged access. With a surface level understanding of the environment and a preconceived respect for the possibility that members of the Game Development Group may share the same nervous awareness of the need for confidentiality, I decided to be completely forthcoming about my role as a researcher in my greetings, interactions, observations, interviews, note-taking, and audio recording. The transparency that came through in my manner of openness in talking about my research seemed to be valued among team members. If I had been secretive in this context, it is likely that it would have seemed weird to them, it would have been an awkward way for me to act, and I would not have been able to record and elicit as much information from them as I did.

They needed to know why I was there, and why I was asking the questions I was asking, which became clearer once they read and signed their statements of informed consent. In general, the team seemed enthusiastic about their work and happy and willing to talk about it. I felt fortunate.

By having a positive and confident attitude about conveying to informants my role as a researcher in meetings throughout the workday, I was able to establish a comfortable and non-threatening report with them, prior to conducting the individual interviews.

The comfort level established within a day of work appeared to be effective, since the interviewees from the game development group were very forthcoming in sharing their perspectives about their work. Site C was best navigated with a strategy that accounted for its corporate privacy, which meant that the focus of ethnographic fieldwork needed to be more about building open and honest relationships with team members, regarding my role as a researcher, rather than being about the effort to conceal my identity as a researcher or limit research activities for the sake of concealment.

The non-traditional approach to ethnographic fieldwork also helped in dealing with the initial concern that my involvement and participation as an apprentice would tamper with the production system in ways that would degrade the scientific integrity of the data. Early on in the investigation, the objective practice of science as a researcher (observing conflict and cooperation) and subjective performance of duties on the team (resolving conflict and promoting cooperation) had not yet appeared symbiotic. Instead, for the sake of limiting my influence on the process under investigation, I thought I would have to continually make decisions to limit the depth of my participation as an apprentice in the process. Table 7 presents the reflective analysis of a moment in which the scientific nature of my awareness as an ethnographic researcher appeared to improve the integrity of the production process.

Table 7 Memo About the Discovery of Emic-Etic Awareness

Critical reflection about “awareness” in fieldwork and team participation
One of my first assignments was to digitize the hand drawn curriculum map, using Microsoft Visio. During this process of data entry, curriculum inconsistencies across domains became quickly visible. The Science SME, for example, radically expanded the

> number of concepts included in the Science Map beyond what was described in the defined scope, while the Music SME strictly limited the size of the Music Map so that it fit the precise description of the defined scope. The inconsistent approaches applied in the development of the Science and Music Maps was a problematic issue that had two cooperating effects.
>
> First, the issue created a situation of conflict in which the appearance of consistency across the Vision Launch curriculum was threatened. Over the course of 15-18 months, problems like these were addressed through negotiation among SMEs, the SME Project Manager, the Education Director, an Instructional Designer, and me, the ID apprentice, in the form of iterative Map revisions, verbal dialogue, and email conversations.
>
> Second, inconsistencies within the Science and Music maps created a situation of conflict that contributed to a more thorough regimen of analysis and enrichment across all curriculum domains, which further validated the integrity of the Map and satisfied stakeholders. In this example, the team's identification of conflict, response of collaborative negotiation, and resulting adaptation and improvement emphasize the importance of team members' objective (emic) and subjective (etic) awareness of the dynamic infrastructure in which they work. An awareness that was both emic and etic improved development of the curriculum by leading the team toward recognizing a potentially threatening circumstance and taking proactive steps to preemptively eliminate this threat.
>
> Potential hypothesis: Objective, or emic, awareness of problematic issues and subjective, or etic, awareness of my role in working with others to resolve problematic issues enhances the resilience of the production system in situations of conflict.

My concern about the extent to which I, as a scientist, should have influenced the production process by helping to resolve conflict through negotiation waned in the wake of this discovery: objective, or emic, awareness of problematic issues and subjective, or etic, awareness of my role in working with others to resolve problematic issues appeared to enhance the resilience of the production system in situations of conflict. In fact, in addition to leadership and funding, one of the most critical forces supporting the production of serious videogames was team members' emic-etic awareness of their work. Discovered as a feature of functional support in the creative collaborative production of serious videogames, the emic-etic awareness that was

readily applied my fieldwork came to the foreground as an emergent behavior and evolving skill amongst team members.

Exemplified in the analysis of memos presented in Tables 6 and 7, organizing the study of culture in ways that functionally enhanced and enriched ethnographic fieldwork required ongoing, critical reflection about how the object of study might affect the fieldwork approach and vice versa. Referred to as methodological relativism (Fischer, 2007), ethnographic fieldwork needed to be methodologically sensitive to the uniqueness of the Vision Launch system. As a first step in developing a semi-structured strategy for guiding the mangled practice of fieldwork, the business entity, production team, and networked organization as a whole was interpreted as a system (Fischer, 2007; Hughes, 1983; Law, 1999) in which the internal practice of doing fieldwork was as relevant to the operation of the system as the production team members and work spaces.

As a researcher and fellow team member, I became an integrated part of the Vision Launch production system, "one of us," said the Art SME. Through both strategic and exploratory decision-making, my performance of fieldwork and apprenticeship was guided daily by the underlying emic-etic awareness of the operation and influence of "culture" in the work of serious videogame production.

The discovery of grounded theory

Guided by grounded theory methods, the selection process for ensuring the data was *relevant* to the research questions directly addressed the challenge of generating both a holistic portrait and a practical theory about the production of serious videogames (Glaser & Strauss, 1999). During the second year of fieldwork, relationships of influence among participant perspectives, realities, affordances, strategy, technique, management, and production were

systematically tracked across a massive amount of ethnographic data. The aim was to generate grounded hypotheses and theories about culture in production.

As I selected, collected, organized, compared, and analyzed data sources, the depth and ethnographic nature of my participation in the field during the first year complimented the second year goal of developing a set of hypotheses and theories that were deeply grounded in the practice and culture of building serious videogames. Forces that both reinforced and destabilized the production system were interpreted as equally informative sources of evidence that contributed to the process of recognizing emergent patterns of activity within the production system. The relevance of evidence was based on the goal of understanding what was both holding together and challenging the solidarity and sustainability of the production system. Creswell (2007) explains that if a group shares a culture, then their language, patterns of behavior and attitudes tend to form a discernible pattern, most directly visible to the researcher through constant observation and interaction with the group under study.

In addition to characterizing culturally situated features of serious videogame production, a major goal of this study was to provide designers with a useful tool for building serious videogames. Even when carried out with alternative strategies for defining one's role as a researcher or making fieldwork more visible, ethnography was philosophically oriented toward the development of a holistic and relative understanding of culture, rather than generalization of concepts and synthesis of theory. Given the need for a methodology that emphasized holistic understanding and one that supported practical theory production, the ethnographic data collected for the study was analyzed, coded, and synthesized with the use of grounded theory strategies.

Interviews, internal documentation, meeting records, and observation records, such as field notes or the comprehensive report of SME feedback on games in progress, were read in search of emergent indicators of influence on the production process, outcomes of the production process, relationships between influences and outcomes, or other patterns of activity. The excerpt in Table 9 presents a collection of facts, or indicators, about SMEs emotional response to the presentation of the Pilot Prototype. Based on this field experience, I developed an emic-etic awareness of the appearance of *enthusiasm* in my first meeting with the Education group.

Observed as a fact, the emotional response of enthusiasm and other emotions were tracked in the data. Eventually, the category of "influence of enthusiasm" was derived from a collection of similar facts as all evidence was continually searched for additional indicators of enthusiasm (Glaser & Strauss, 1999, p. 23). In Table 8, examples are presented of specific facts that were coded in the analysis as indicators of the greater concept of enthusiasm (Glaser & Strauss, 1999, p. 23).

Table 8 Excerpt from Memo About the Experience of Entering the Field

The Education group's response to Vision Launch's first prototype
The current of applause and joyful commentary among SMEs was an overt emotional indication of the Education group's collective sense of satisfaction, and admiration. With the powerful compliment of highly developed prototype imagery, the strategy consultant and Education Director clarified the project scope and reemphasized the team's mission through live, face-to-face dialogue and an impressive presentation of achievement. Confirmed in follow-up conversations with the SME project manager and in interviews with meeting participants, the combination of audiovisual presentation of scope and mission, face-to-face dialogue, and the positive nature of the news reported appeared to foster the collective sense of enthusiasm and understanding among members of the Education group.

The consistent appearance of the emotional dichotomy of enthusiasm and disappointment confirmed the relevance of this category in the production system. Codes (ENTH-INFLUENCE

= influence of enthusiasm on the production system) and related properties (ENTH-MAINTAIN = evidence of leadership strategies for maintaining enthusiasm) were assigned to the categories and marked in the data as they helped to further identify, define, and characterize individual categories. Over time, "breakdown of enthusiasm" also became a property of this category. Selections of data presented in Table 9 further reinforced the influence of specific events and activities that caused an emotional response among team members about their work.

Table 9 Selections from Data Sources That Indicated Personal Investment in Work

Source	Indicators of emotional response to work
Field notes	SME enthusiasm when viewing the Pilot Prototype skyrockets every time we watch the [Rio] video
	After "the death of [Rio]," SME disappointment is expressed when discussing the Pilot Project. Mathematics SME 1, Language Arts SME 1, and SME Project Manager are consistently the most vocal about it.
	Informal conversations with SMEs and project managers confirmed the enthusiasm for the Pilot Project and disappointment, re: its disappearance
	SMEs are not enthusiastic about the game reviews they are completing for PlayWorld, since the production quality does not meet expectations, based on [Rio]
	Social Studies SME 2 is disappointed in the progress made in the development of good PlayWorld games, especially now that the informant has seen the [Rio] video; suggestions made to help improve quality of game
	SMEs seem unsure about the aims of the game design team, since their suggestions for changes not always applied during revision stages
	SMEs enjoy playing the PlayWorld prototypes together as a group
	Social Studies SMEs sent emails expressing excitement about the appearance of a couple of Social Studies oriented PlayWorld games during the last Sprint
Individual interviews	SMEs confirmed enthusiasm for the Pilot Project and disappointment, re: its disappearance

Eventually, all categories related to ENTH contributed to the emergent core theme of management and the sub-theme of soft skills. Drawn from an analysis of categories and fact patterns, these hypotheses were determined:

1. Except in situations of corporate decision-making from outside of Vision Launch, team members who appeared to have high levels of enthusiasm in meetings and email correspondence were able to sustain long-term positions on the team; were more likely to have personal connections to their work, work place(s), and co-workers; and were inspired.
2. Maintenance of enthusiasm helped to sustain the integrity of production because it stabilized a consistent workflow and collective effort among team members who appeared enthusiastic.

Factors affecting the maintenance of enthusiasm included and were not limited to work environment, relationships among team members, team members' sense of purpose, and team members' sense of trust among other team members.

In the process of discovering patterns across the data, evidence of alignment and misalignment between the serious videogame production process and Fischer's (2007) explanation of culture were explored. As the culture of serious videogame production, over time, became consistently recorded in field notes and memos as a "system" or "infrastructure," Fischer's (2007) historically grounded characterization of culture as a "relational, complex whole whose parts cannot be changed without affecting other parts," became increasingly relevant in structurally organizing the empirically grounded knowledge about Vision Launch culture (p. 1). Fischer (2007) defines culture in the following way:

> Culture is (1) that relational (ca. 1848), (2) complex whole . . . (1870s), (3) whose parts cannot be changed without affecting other parts (ca. 1914), (4) mediated through powerful and power-laden symbolic forms (1930s), (5) whose multiplicities and performatively negotiated character (1960s), (6) is transformed by alternative positions, organizational forms, and leveraging of symbolic systems (1980s), (7) as well as by emergent new technosciences, media, and biotechnical relations (ca. 2005). (p. 1)

In consideration of the emergent consistencies between each aspect of this definition and the patterns of activity observed and analyzed during the process of constant comparative data analysis, data analysis and theory generation was further refined in consideration of Fischer's (2007) explanation of culture.

Fischer's (2007) interpretation of culture as an experimental system helped me to miore fully envision the way in which Vision Launch culture might compare to other types of systems, including instructional systems (Branch, 2009; Dick, Carey, & Carey, 2005), game systems (Salen & Zimmerman, 2004), actor networks (Callon, 1999), and technological systems (Hughes, 1983; Law, 1999). Rather than focusing primarily on the *influences* of diversity of professional culture among differing groups or the *influences* of the shared emergent culture on the production process, the concept of culture as "a relational whole" fit the conception of production as a system, or infrastructure, which performed and produced its own culture. Team members' performance of Vision Launch culture was also their performance of the Vision Launch production process within the Vision Launch production system.

Through constant comparative analysis of field notes, interview transcripts, game design documents, team email correspondence, and other relevant documentation, patterns of activity were noted, memos elaborating ideas and observations of activity were composed, and all data was coded for its relevance to the research questions (influence of culture on production), along with the degree to which it helped to explain the holistic, systemic Vision Launch culture (influence of production on culture).

Conclusion

In this study, ethnographic and grounded theory practices provided a useful means for investigating and interpreting a highly complex production network, situated within an organization of innovation and creativity. The analysis of findings from this study showed that the serious videogame production system was naturally and organically entrenched in a culture that reinforced its functional solidarity and strength in performance.

With the passage of two years in total, the influx of collaborative planning meetings, a significant increase in open dialogue, and the more frequent assignment of shared tasks, team interaction increased tremendously, revealing more overtly the subtle variability and overt consistency in professional affiliation, expertise, beliefs, perspectives, skills, and competencies among team members of differing professions. What grew over time and through interaction was the team‘s collective identity as a culture-sharing group.

Found in evidence of playfulness among informants, the production team appeared to enjoy working together. Team members celebrated holiday festivities together. They cheered for each other on race days. They helped, taught and learned from each other. They mailed a box full of gifts across the country for the newborn child of a colleague they had never met in person. They planned social events together, some of which occurred in the workplace during non-business hours. They tailgated, gone bowling, and brought flowers in times of need. They were ecstatic when a formerly technophobic SME walked into a meeting with a brand new iPad. They saran wrapped the Education Director’s office; “Happy Birthday! Love, The Kids.” Analyzed with grounded theory methods, data consistently showed that team members performed and participated in the cultures of their native professions and in the social trends and culture they were developing within the Vision Launch production system.

The social construction of methods for this inquiry were further subverted and enhanced by my own lack of expertise in formal academic inquiry. The greatest challenge and perhaps the greatest achievement in the making of this academic artifact was that I grew to care for, respect, support, and be continually inspired by my teammates as idols, mentors, colleagues, and friends. In the form of a socially constructed dissertation, the story and study of Vision Launch was composed at the hands of an apprentice, guided by interest, inspiration, will, intuition, and belief

and enabled by an ability to learn and adapt to the constraints of accepted qualitative methods of inquiry for the sake of generating relevant, potentially helpful, comprehensible, and empirically valid knowledge of a system of constant growth and change.

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CHAPTER 5

TEAM WORK: A STUDY OF COLLABORATIVE INNOVATION IN THE MAKING OF SERIOUS VIDEOGAMES[7]

[7] Garner, G. J. and M. Orey. To be submitted to *Educational Technology Research and Development*.

Abstract

The purposes of the study were to (a) generate a holistic understanding of culture shared among team members, who were employed in the making of digital, education-based games, (b) explore relationships between shared culture, the production process, and games that were produced, and (c) use these data to guide the development of theory about enterprises, or systems, of innovation, specifically those that produce digital, education-based games, referred to in this essay as serious videogames (SVGs). The workforce of Vision Launch[8], the newly formed business group under study, collaboratively sustained production by envisioning and delivering SVGs designed to promote enjoyment in play and experiential learning among children. From two years of ethnographic fieldwork in the Vision Launch workforce, selections from individual interviews, email exchanges, field notes, conceptual and technical design documentation, meeting notes have been used to exemplify core discoveries within the socially constructed, culturally situated system of Vision Launch. The findings strongly suggested that the Vision Launch's approach to the making of SVGs reinforced its own organizational fortitude, sustainability, and success within corporate system in constant transition. Grounded in these findings, a theory has been formed, which outlines system components that enable the conditions for the sustainable innovation of serious videogames.

[8] Acronym

Introduction

Fueled by the collective effort of skilled, professionally diverse teams of experts, the making of digital, education-based games has unfolded through strategic exploration of and experimentation with production processes (Raybourn, 2007; Barab et al., 2007; Bogost, 2007; Moreno-Ger, Burgos, Martinez-Ortiz, Sierra, & Fernandez-Majon, 2008; Gunter, Kenny, & Vick, 2008; Schell, 2008; Shute, Ventura, Bauer, & Zapata-Rivera, 2009; Jarvis & De Freitas, 2009; Harteveld, Guimaraes, Mayer, & Bidarra, 2010). Digital, education-based games, referred to in this essay as serious videogames, have been unique artifacts of innovation born from the work of experts in digital media, education, psychology, and entertainment, and they represent a mash-up of beliefs and empirical findings about the influences that education and entertainment could or should have on one another.

The phrase, *serious videogame*, has been selected to refer to digital, education-based games and game environments designed to entertain and to teach concepts through play. The root subject, *videogame*, refers to an interactive digital environment in which users are exposed to an enjoyable and engaging experience of play. The added descriptor, *serious*, is a quality referring to a system in which users are expected to achieve learning gains through exposure to pedagogically oriented content, such as geometry concepts or international conflict resolution tactics. In a serious videogame, the activity of play within the videogame is the catalyst for the following intended cause and effect: as the player plays the serious videogame (SVG), he/she is entertained and engaged, while internalizing intentionally integrated content and constructing new knowledge.

In support of game designers', instructional designers', and researcher-practitioners' challenging aim to achieve an ideal balance of play and learning (Barab, Gresalfi, & Ingram-

Goble, 2010) in the making of SVGs, empirically grounded analyses of the varying degrees to which SVGs, videogames, virtual worlds, and game-based learning environments have entertained and educated players or were technologically and creatively feasible have provided insight into practical design considerations for the making of SVGs (Barab, Dodge, Carteaux, & Tuzun, 2005; Barab et al., 2007; Belloti, Berta, De Gloria, & Primavera, 2010; de Freitas, Rebolledo-Mendez, Liarokapis, Magoulas, & Poulovassilis, 2010; Dickey, 2011; Fields & Kafai, 2009; Harteveld, Guimaraes, Mayer, & Bidarra, 2010; Kafai, 2008; Klopfer & Squire, 2008; Merchant, 2010; Moreno-Ger, Burgos, Martinez-Ortiz, Sierra, & Fernandez-Majon, 2008; Rankin, McNeal, Shute, & Gooch, 2008; Ritterfield, Cuihua, Wang, Nocera, & Wong, 2009; Salen, 2007; Sheridan & Hart-Davidson, 2008; Shute, Ventura, Bauer, & Zapata-Rivera, 2009; Sorensen & Meyer, 2007; Thompson et al., 2010; Torres, 2009; Westera, Nadolski, Hummel, & Wopereis, 2008). However, a design approach, grounded in ethnographic data, that has emphasized a culturally situated process for creating games capable of entertaining and educating has not yet been shared in academic research published to date.

Given the complex sociological, technological, economic, and other contextually relevant factors that have influenced the innovation of many forms of digital media (Deuze, 2007; Jenkins, 2006; Law, 1999; O'Donnell, 2011), designers' production of SVGs within the context of a rigid, top-down model was not considered to be a fitting approach to the making of SVGs. As a result, this study aimed to articulate an empirically grounded theory about an innovation process facilitated within the socially constructed, strategically mediated contexts of communication and performance among creative visionaries and makers, including a team of producers, educators, designers, artists, engineers, and researchers. The focus of study was an SVG production team's collaborative practice of design, development, and delivery, including its

strategy for resolving the core design constraint, which was that all games needed to expose players to a balance of entertainment and education.

Conceptual framework

Glaser and Strauss (1999) have argued that while the grounded theory approach implied the intention to orient researchers toward the generation of new knowledge and was not designed to force new material to fit within an established theoretical construct, utilizing formal and substantive theory as a starting point or "strategic link in the formulation of grounded theory" has been considered a valid and sometimes necessary approach to the design of qualitative investigations and the development of empirically grounded theory (p. 79). With regard to the process of designing and developing SVGs, conceptual frameworks from the fields of science and technology studies (Fischer, 2007; Law, 1999; Callon, 1999), and software development (Beck et al., 2001; Schwaber, 2004; Schwaber & Sutherland, 2008) have been most relevant, since they have presented complex production processes as cohesive, dynamic systems of activity and interaction.

Complex systems of activity and interaction

Law (1999) characterized technology as a growing system of functional relationships that inevitably experiences change, imbalance, and a subsequent cascade of related changes and imbalances across the entire system until the point at which equilibrium is once again restored. In the following passage, he emphasizes the difference between the study of "dynamics" (movement) and "statics" (rest and equilibrium):

> Because actors or components in a system are functionally related, changes in one or more cause imbalances or reverse salients in the advancing system until the other components cascade and adjust to achieve an optimal interaction. Because technological systems are growing or changing, the analysis [of systems] should be analogous to dynamics (the study of motion and equilibrium) rather than to statics (the study of rest and equilibrium). System components interacting harmoniously - without imbalances or

> reverse salients - while the system grows can be thought of as being in dynamic equilibrium. (Law, 1999, p. 13-14)

As a comparative point of reference, Law's (1999) interpretation of technology as systems of "motion and equilibrium" is characteristic of modern organizations, businesses, institutions, governments, and production teams in the sense that most of these commercially and socially constructed entities have demonstrated a tendency to grow, change, and continually *aim* to achieve an ideal state of "dynamic equilibrium," in which system components (activities, team members, beliefs, artifacts, etc.) interact "harmoniously – without imbalances or reverse salients – while the system grows" (p. 14). Given that this investigation aimed to articulate the complex operation and influence of a diverse, geographically dispersed, and culturally entrenched production team, the study of organizational dynamics required a focus on individual team members' criteria for and achievement of dynamic equilibrium, along with their responses to imbalance in their unique system of SVG production. By approaching the production team as a complex, networked system, it was possible to identify various influences and features of the system, such as artifacts, strategies, values, or perspectives, and to explore the ways in which each component facilitated or destabilized the process of creating SVGs.

The challenge of approaching a human organization as a system of components that have facilitated a particular technological production is that human activity and decision has typically been influenced by sociologically, technologically, economically, and otherwise cultural forces, of which team members may not be aware. Callon (1999) described one approach to technological production "as a succession of steps from the birth of an idea (invention) to its commercialization (innovation) by way of its development," but questioned "the claim that it is possible to distinguish during the process of innovation phases or activities that are distinctly

technical or scientific from others that are guided by economic or commercial logic" (p. 84). Callon (1999) further explains:

> For example, it is often believed that at the beginning of the process of innovation, the problems to be solved are basically technical, and that economic, social, political, or indeed cultural considerations come into play only at a later stage. However, more and more studies are showing that this distinction is never as clear-cut. This is particularly true in the case of radical innovations: Right from the start, technical, scientific, social, economic, or political considerations have been inextricably bound up in an organic whole. Such heterogeneity and complexity, which everyone agrees is present at the end of the process, are not progressively introduced along the way. They are present from the beginning. (p. 317)

Considering the reality that technical, scientific, social, economic, or political conditions have been woven into technology by groups of humans that collaboratively engineer these artifacts, the system of SVG production, including its components and their dynamic operation, modified this inquiry such that it methodologically account for technical, social, economic, political, or other contextually relevant forces of influence.

As a complex system of interactive components, the dynamic operation and destabilization of the production team (Law, 1999), along with contextually and culturally relevant conditions of influence (Callon, 1999), were contextually reflective of Fischer's (2007) characterization of culture as an experimental system in which humans have naturally and systematically engaged in scientific processes, including inquiry, interpretation, strategic intervention, assessment, critical reflection, and modification of behavior or situation, based on overt and covert responses to external forces and conditions. Fischer's (2007) historically grounded definition of culture as a "relational, complex whole whose parts cannot be changed without affecting other parts" has reinforced the quality of dynamic equilibrium (Law, 1999) in complex systems:

> Culture is (1) that relational (ca. 1848), (2) complex whole . . . (1870s), (3) whose parts cannot be changed without affecting other parts (ca. 1914), (4) mediated through powerful and power-laden symbolic forms (1930s), (5) whose multiplicities and performatively negotiated character (1960s), (6) is transformed by alternative positions,

> organizational forms, and leveraging of symbolic systems (1980s), (7) as well as by emergent new technosciences, media, and biotechnical relations (ca. 2005). (p. 1)

As a complex, relational culture system made up of interactive human and non-human components (Fischer, 2007), the dynamic operation, destabilization, and equilibrium of the production team (Law, 1999), along with contextually and culturally relevant conditions and forces of influence (Callon, 1999), have been studied and comparatively analyzed through the lens of the team's evolving production paradigm, which featured the covert expression of an Agile-oriented philosophy (Beck et al., 2001) and the overt performance of a Scrum-based development process (Schwaber & Sutherland, 2008). Data discovered in the team's collaborative practice of SVG innovation was organized and comparatively analyzed in relation to its unique expression of the complimentary frameworks of Agile and Scrum, which have both been formally defined, developed, and adapted among software development teams over the course of the last ten to fifteen years (Highsmith & Cockburn, 2001; Schwaber & Sutherland, 2008).

Agile philosophy

Published for the first time in the form of an online document in 2001, the "Manifesto for Agile Software Development" was the product of an informal, two-day meeting of self proclaimed "organizational anarchists," (Beck et al., 2001, par. 2) who represented "Extreme Programming, Scrum, DSDM, Adaptive Software Development, Crystal, Feature-Driven Development, Pragmatic Programming, and others sympathetic to the need for an alternative to documentation driven, heavyweight software development processes" (par. 1). Throughout the 1990s, these individual processes, including Scrum, emerged out of managers', producers', and developers' need for functional, "light or lightweight" (par. 10) methodologies that would help

production teams “to move aggressively into the era of e-business, e-commerce, and the web” (par. 8).

Reflective of an emergent professional culture, proponents of the Agile movement “embrace modeling, but not in order to file some diagram in a dusty corporate repository. We embrace documentation, but not hundreds of pages of never-maintained and rarely-used tomes. We plan, but recognize the limits of planning in a turbulent environment” (par. 9). The Agile manifesto and professional movement emerged as a reactionary response to enforcers of idealized, top-down processes that, in practice, had proven delays in product delivery, decreases in product quality, and underestimated budgetary needs (Hobday & Brady, 2000).

Ultimately, authors of the Agile manifesto sought a value-driven approach to their work that would be founded on mutual trust and respect and would support the development of “organizational models based on people, collaboration, and building the types of organizational communities in which [authors of the manifesto] would want to work” (Beck et al., 2001, par. 5). The fundamental tenets of the Agile approach demonstrated proponents’ enhanced and apparently professionally unique values for individuals and interactions (more than processes and tools), working software (more than comprehensive documentation), customer collaboration (more than contract negotiation), and response to change (more than following a plan) within the context of building software (Beck et al., 2001).

The authors integrated these values into their definition of the following twelve “principles behind the Agile Manifesto”: (1) Our highest priority is to satisfy the customer through early and continuous delivery of valuable software; (2) Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage; (3) Deliver working software frequently, from a couple of weeks to a couple of months, with a

preference to the shorter timescale; (4) Business people and developers must work together daily throughout the project; (5) Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done; (6) The most efficient and effective method of conveying information to and within a development team is face-to-face conversation; (7) Working software is the primary measure of progress. Agile processes promote sustainable development; (8) The sponsors, developers, and users should be able to maintain a constant pace indefinitely; (9) Continuous attention to technical excellence and good design enhances agility; (10) Simplicity--the art of maximizing the amount of work not done--is essential; (11) The best architectures, requirements, and designs emerge from self-organizing teams; and (12) At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

When applied in relevant development contexts, these principles were intended to serve as general guidelines for the strategic development of systems of technology and human organization. Since the articulation and release of the Agile philosophy, specific methodological frameworks for development, such as Scrum, have been further refined to suit the emergent needs of developers who have sought to apply the Agile philosophy in practice. Although the Scrum framework first appeared and was used prior to the crystallization of the official Agile philosophy, the founders of Scrum were two of seventeen authors of the Agile manifesto, which was evidence that these founders' unique production framework could be and most likely had been applied in ways that supported the Agile philosophy.

Scrum framework

Shaping many of the ways in which team members collaborated with each other and with clients, Scrum was designed to engage design teams in a highly productive and fundamentally

human process of product development in consideration of the following culturally, professionally situated condition:

> The people developing software all have different skills, intelligence levels, experience, viewpoints, attitudes and prejudices. Everyone wakes up in a different mood than the day before, depending on his or her sleep, health, weather, neighbors, and families. These people then start to work together, and the complexity level goes through the roof. (Schwaber, 2004, p.5)

Grounded in empirical process control theory, Scrum has been conceived by its creators as "a framework within which you can employ various processes and techniques. The role of Scrum is to surface the relative efficacy of your development practices so that you can improve upon them, while providing a framework within which complex products can be developed" (Schwaber & Sutherland, 2008).

Users of Scrum have been prescribed a core set of implementation strategies, in which the values of transparency, inspection, and adaptation have been defined as fundamental pillars of the production process (Schwaber & Sutherland, 2008). The experimental and flexible nature Scrum's lightweight framework for software development was characterized with this note from Schwaber and Sutherland (2008), "when rules are not stated, the users of Scrum are expected to figure out what to do. Don't try to figure out a perfect solution, because the problem usually changes quickly. Instead, try something and see how it works. The inspect-and-adapt mechanisms of Scrum's empirical nature will guide you" (p. 5). While Scrum has appeared to allow for contextually relevant experimentation and flexible process control, the successful operation of the framework has relied on the use of specifically defined and interrelated terminology, rules, desired behaviors, desired competencies, and desired attitudes. These components are carried out within a set of six structured contexts of performance, or time-boxes, of activity.

Time-box 1. Based on the Scrum framework, some combination of the Team, Scrum Master, and Product Owner begin facilitating the development and delivery (release) of products by, first, conducting an optional Release Planning Meeting in which they answer the questions, "How can we turn the vision into a winning product in the best possible way? How can we meet or exceed the desired customer satisfaction and Return on Investment?" During the Release Planning Meeting, the team establishes the probable delivery date, costs, major risks, and overall features and functionality of the release.

Time-box 2. In consecutive time frames, the Team achieves its release goal through the "time-boxed" activity of iterative Sprints, which last no longer than one month. During each Sprint, team members complete concretely defined projects, including what is to be built, the plan for building it, the actual work completed according to plan, and a resultant product. All team members are involved in projects.

Time-box 3. During each Sprint, Daily Scrum meetings occur in the same place and at the same time each day, and the Scrum Master enforces a strict fifteen-minute time limit. The purpose of the daily meeting is to inspect the team's progress toward the Sprint goal and facilitate all necessary adaptations, based on the empirical inspection. Each team member explains (a) what he or she has accomplished since the last meeting, (b) what he or she is going to do before the next meeting, and (c) what obstacles are in his or her way.

Time-box 4. At the end of each Sprint and before the start of the upcoming Sprint, the Team presents the product's functionality to stakeholders, clarifying and answering questions about what was done, during the Sprint Review Meeting, which is a two-hour, time-boxed event. The Product Owner identifies what has and has not been done, and the Team discusses problems that arose, the ways in which problems were dealt with, and what went well.

Time-box 5. After Sprint Review, the Scrum Master encourages the Team to critically reflect on its own development process within the context of the Scrum framework and revise the process to make it more effective and enjoyable for the upcoming Sprint. The purpose of the Sprint Retrospective Meeting is to inspect how the ending Sprint went in regards to people, relationships, process, and tools; to identify and prioritize major items that went while and those items that, if done differently, could make things even better; and adapt to empirical inspection by identifying actionable improvement measures to be implemented in the upcoming Sprint.

Time-box 6. During the Sprint Planning Meeting, the team figures out how it is going to build functionality into a product increment during the Sprint and defines the Sprint goals. Others may also be invited to attend the Sprint Planning Meeting in order to provide technical or domain advice. Schwaber and Sutherland (2008) explained that a "new team often first realizes that it will either sink or swim as a team, not individually, in this [Sprint Planning] meeting. The Team realizes that it must rely on itself, and as it realizes this, it starts to self-organize and to take on characteristics and behavior of a real team" (p. 13).

The SVG production team's practice of Agile principles within the Scrum framework was explored with the intention of drawing connections between the influences of these concepts on the potential success and emergence of culture among production team members. Given the interplay of flexibility and constraint prescribed by Scrum, it was anticipated that factors influencing the team's application of Scrum and Scrum's influence on the team's work would, at some point, breach the conceptual boundaries of this concretely defined, adaptive, and iterative process of production. The application of ethnographic and grounded theory research methods were applied to capture relevant data, regarding components and conditions of the system that were and were not able to fit within the complementary frameworks of Scrum and Agile.

Methods

The purposes of this investigation were to (a) generate a holistic understanding of culture shared among team members, who were employed in the making of serious videogames, (b) explore relationships between shared culture, the production process, and the serious videogames (artifacts of innovation) that were produced, and (c) use these data to guide the development of a theory about enterprises, or systems, of innovation, especially those that produce SVGs.

The core research question inquired, in what ways did culture influence the work of serious videogame production? The following four sub-questions helped to further define the inquiry: (1) How did design team members define their roles, responsibilities, activities, experiences and contributions?; (2) In what ways did these realities (roles, responsibilities, activities, experiences, and contributions) influence the production of serious videogames?; (3) What types of affordances surfaced as a result of team collaboration and interaction within the context of the team's participation in serious videogame design practices?; (4) How did team members mediate differences in personal worldview and perspective as these arose in various activities, such as the resolution of design problems?

Both ethnographic (Creswell, 2007) and grounded theory (Glaser & Strauss, 1999) methods were used to investigate the business of Vision Launch and its workforce, the production team. The benefit of having a blended methodological approach was its capacity for capturing an expansive, contextually rich font of data through ethnographic fieldwork (Faubion & Marcus, 2009) and systematically orienting the analysis of an enormous amount of qualitative data toward the identification of relevant patterns through constant comparative analysis (Bogdan & Biklen, 2007; Glaser & Strauss, 1999).

Data sources

Data sources were consolidated into categories, including interview transcripts, internal documentation, meeting records, and observation records, which have been listed in Table 10, along with their relevance to the core sub-set of research questions. Semi-structured individual interviews (Creswell, 2007) were conducted with 22 of 41 informants. Each interview was an average of 60 – 90 minutes in length, and great care was taken to ensure that the interviews were conducted in a quiet space in which informants were comfortable. Informants were strategically selected on the basis of my ability to access them, informants' will to participate, and the information needed to generate a holistic picture of Vision Launch that represented a variety of perspectives.

Table 10 Alignment Between Data Sources and Research Questions

Data sources	Research questions			
25 interviews	1	2	3	4
Internal documentation				
300+ email conversations	1	2	3	4
Digital prototypes		2	3	
Images		2	3	
Video recordings		2	3	
PowerPoint presentations (3)		2	3	
Meeting records				
Video recordings (3)	1	2	3	
Audio recording (1)	1	2	3	4
Agenda documents (4)		2	3	
PowerPoint presentations (3)		2	3	
Observation records				
Field notes	1	2	3	4
Research memos	1	2	3	4
Photographs		2	3	
Audio recordings	1			4
Sketches	1	2		

From the live and online spaces of Site A, 11 subject matter experts (SMEs) and 1 SME project manager were interviewed. From the live and online spaces of Site C, 2 strategy consultants and 1 instructional designer were interviewed. From the live and online spaces of Site B, 1 executive producer, 1 education director, 1 game development lead, 2 artist-designers, and 2 engineer-designers were interviewed.

Toward the end of Year 2, game developers migrated and stored much of the game development documentation to a shared, security-enabled weblog. The weblog became an online repository of design and development records, including wireframe prototypes in development. In addition, eleven mini-SVGs were released and integrated into the client's MMOG, PlayWorld.

In addition to conducting interviews and analyzing the exchange of written and displayed discourse, I observed and wrote critical and reflective memos documenting the experiences, activities, and perceptions of 22 informants in their emergent roles and work activities. Through working collaboratively with team members as an instructional design apprentice, I was able to experience the team's social construction (Duranti, 1994; Latour, 1996) of SVGs through a shared work experience, and I gained physical access to (Site A) corporate headquarters and (Site B) the central meeting atrium of SMEs. I collected photographs, sketched diagrams, and composed and collected notes from experiences in small and large group meetings in both of these locations and via Skype videoconference. The work place of system engineers (Site C) and the client workplace (Site D) were experienced virtually in technologically mediated online spaces.

Length of study

In the timeline of organizational growth, shown in Table 11, key moments of organizational development have been outlined over the course of Vision Launch's first three

Table 11 Timeline of Organizational Growth

VL Formation	Year 1		Year 2		Year 3	
Vision integration	05/08	VL execs refined & initiated vision	05/09	VL execs began presenting mission & related services to internal corporate franchises		
Team formation	05/08	execs, producers, project managers, strategy consultants, education group, game dev. company	11/09	internal game engineers and artist hired to replace external game dev. company	05/10	company relieved top 2 VL execs of duties & dissolved VL for 48hrs; VL exec producer & education director appointed as new VL leaders; VL group migrated from one division to another division of company
Curriculum development	05/08	SMEs & IDs developed curriculum maps & appending resources		<< on-going through Year 3 >>	08/10	SMEs revised CMs; SMEs began providing prototype feedback once every 2 weeks
Pilot prototype development	05/08	VL began building prototype that exemplified ideal game world & proved capacity for creating high quality SVGs	05/09 10/09	VL unveiled prototype full development of pilot concept "shelved" due to lack of corporate (financial) support	04/11	gained corporate support needed to re-launch production of pilot concept
Corporate charter with PlayWorld franchise			02/10	VL team saw first success in effort to provide services for internal corporate franchise; began producing SVGs for existing MMOG franchise, PlayWorld	07/10 -3/11	11 games went live

years of existence. As an instructional design apprentice and participant-observer, I worked and conducted fieldwork with the Vision Launch team during Years 2 and 3.

Field sites

Discovered in the performance of activities that enabled and supported the making of SVGs, the Vision Launch field of study featured an emergent pair of social performance contexts that were shared across the dimensions of time and space in the physical and virtual spaces of Sites A, B, C, and D. Multi-sited ethnography moves away from "place-based notions of the field" (Hall, 2004, p. 109) to what Marcus (1998) referred to as "a multi-sited research imaginary" that explores how ways of making meaning connect people as they circulate "across time and space" (Hall, 2004, p. 109). Relevant field spaces included those in which production-related work took place.

Site A, located on the western U.S. coast, was the Vision Launch corporate headquarters. It was also the collaborative work and meeting space for the game development group. Fieldwork conducted in the physical space of Site A required a semi-structured approach, complimented with off-campus, remote, and informal interaction among informants. By having a positive and confident attitude about conveying to informants my role as a researcher in meetings throughout the working day, I was able to establish a comfortable and non-threatening report with them, prior to conducting individual interviews.

The comfort level established within a day of work appeared to be effective, since the interviewees from the game development were very forthcoming in sharing their perspectives about their work. Site A was best navigated with a strategy that accounted for its corporate privacy, which meant that the focus of ethnographic fieldwork needed to be more about building open and honest relationships with team members, regarding my role as a researcher, rather than

being about the effort to conceal my identity as a researcher or to limit research activities for the sake of concealment.

Site B, located on the eastern U.S. coast, was the collaborative work and meeting space for SMEs, the SME project manager, and the instructional design apprentice. In meetings with the education group at Site B, fieldwork practices, such as note taking or asking for clarification of meaning, were easy to complete discretely during sessions of traditional participant observation, since part of my role as an apprentice involved keeping detailed notes about meeting activities and discussions. While I was fully aware of my strategic observation methods, it was not always obvious to the team members that I was actually working, given the typical "concealment and agreed misrecognition of ethnographic labor" (Breglia, 2009, p. 133). During team meetings, a common form of organized, interactive work among Vision Launch team members, my work as an apprentice complimented my work as a researcher.

Site C, located in the south-central region of the U.S., was the collaborative work and meeting space for the engineers. These team members included the strategy consultants, system architect, engineers, and the instructional designer. Site D was the work place of the Vision Launch client. Listed in Table 12 contexts in which work was observed across all sites were defined by the categories of conversational dialogue and online discourse.

Table 12 Contexts of Communication and Performance in Team Work

Category of evidence	Contexts of communication and performance	Site
conversational dialogue (natural & spontaneous)	in face-to-face, formal, and informal professional office spaces; in restaurants during casual dinner events with Vision Launch teammates; during personal or group telephone calls	Sites A & B
	during technologically mediated, synchronous, online videoconferences	Sites A, B, & C
online discourse (asynchronous message design, delivery, & exchange)	security-enabled mail; security-enabled weblog	Sites A, B, C, & D

Informants

In the context of the production system, the 22 informants were people who participated in Vision Launch production. The education group included the Vision Launch education director, the education lead (strategy consultant), the SME project manager, 12 curriculum SMEs, 2 game SMEs, 2 research apprentices, and 1 instructional design apprentice. The education director was "internal" to, or a full time permanent employee of, Vision Launch and was part of both the education group and the game development group. The informant was physically located at the corporate headquarters, Site C. The strategy consultant, 21st Century Skills SME, and Music SME 2 were located remotely in the online spaces of Sites C, A, and B, respectively. Like all team members, remote team members participated in highly differentiated aspects of production through travel, email, telephone, and videoconference. The game development group included the executive producer, 1 internal game development lead, 1 strategy consultant 3 artist-designers, 1 network engineer, 5 engineer-designers, and the education director.

Data collection procedures

During the first year of research (Year 2 from the Timeline of Organizational Development), I explored the field of study with the goal of understanding patterns of perspective, activities, and interaction in the performative contexts of live conversation and online discourse. The influence of culture on the SVG production process was the central focus. The benefit of an ethnographic approach to data collection was that it aimed to generate holistic knowledge of the operation of cultures in production (Creswell, 2007), and as a result, areas of both anticipated and unanticipated relevance could be identified, explored, and articulated.

The following research activities and appending examples of these kinds of activities generated knowledge, emergent themes, and empirically grounded theory about the cultural system of building serious videogames:

1. content analysis: selected relevant multimedia from the game development group's online blog and wrote analytic memos about a field experience
2. spatial mapping: sketched and photographed images of sites or meeting arrangements, using *OmniGraffle* software or a pencil and paper
3. multimedia review: searched for previous empirical records and observed online activity outside of the production context
4. observation: audio recorded a meeting and watched the team interact with an inquisitive focus and openness of mind and heart
5. elicitation: informal conversation via email and formal interview
6. participation: performed assigned duties and developed professional relationships as a fellow team member

Breglia (2009) and Fischer (2007) have explained that the conventional goal of ethnographic fieldwork has been to understand the "native" point of view through extensive participant observation, engagement in language and practice, extensive formal and informal interviews, creation of data, development and translation of a holistic sense of lifestyle, and a representation of this holistic sense as a model for comparison (p. 131). Aligned with a traditional ethnographic approach, field observations from the production team's work space and the formal and informal reflections of informants formed the basis of comparative analysis, especially during the first year of study (Geertz, 1973). Perspectives of the production team, "including beliefs and values that underlie and organize their activities and utterances," emerged from a diverse collection of

data, and they were comparatively analyzed for patterns of similarity and difference among all informants (Ochs & Schieffelin, 2001).

Vision Launch team members' linguistic performance (Hymes, 2001), affective behavior (Krathwohl, Bloom, & Masia, 1973), and application and development of psychomotor skills (Simpson, 1972) were noted, tracked, and analyzed in the contexts of live conversation and online discourse. Since the aim of ethnographic inquiry was to generate a holistic cultural portrait (Creswell, 2007), the challenge of this approach within the context of Vision Launch was reconciling the requirement of delivering a holistic interpretation of culture with a sense of social responsibility to learn and report practical information as a way of helping to improve the work of other production teams that build SVGs. Since the granular details of an ethnographic portrait may not be of great importance to a design practitioner, data from this study was analyzed, categorized, and coded based on its relevance to the research questions, which targeted the influence of culture on the production process, and to the practical frameworks of Agile and Scrum, which highlighted the ways in which deliberately applied values have unfolded in contexts and spaces of production.

Data analysis procedures

Interviews, internal documentation, meeting records, and observation records, such as field notes or the comprehensive report of SME feedback on games in progress, were read in search of emergent indicators of influence on the production process, outcomes of the production process, relationships between influences and outcomes, or other patterns of activity. After each interview, the audio files were delivered to a transcriber for transcription. Interview transcripts, along with all other forms of data, were continually reviewed for indicators of its relevance to the research questions and variability of its indication. Data was categorized, based on its form

(interview, wireframe prototype, email conversation, etc.), and continually examined for internal and external validity. In cases when the validity or meaning of informants' statements from interviews, meetings, or informal conversations were unclear, additional member checks were conducted.

The interview guide (see Appendix A) served as source of validity in the sense that several of the same questions were asked of all informants as a way of ensuring that my interpretation of varying events, values, or concepts had been perceived correctly. With each interview, some questions were asked as a way of determining the degree to which some of the material shared by other informants, such as references to specific events, time frames, activities, or perceptions, was perceived in the same way or was truthful. Data considered suspect or not defensible set aside for further review at a later time.

The data set was transformed over time into varying displays of chronologically organized, narrative, and diagrammed content. Observations, field notes, and interviews were further elaborated in the form of memos, in which I critically reflected upon and reacted to various activities, artifacts, events, interview experiences, or informant behaviors or attitudes that were performed and expressed in these activities, artifacts, events, and interviews. Notes were created for critical incidences using Evernote, and symbolic data, including photographs, audio recordings, video recordings, and digital sketches, were uploaded to Evernote and attached to relevant notes of critical incidences. tagged with codes that linked these data with the incidences and other data, including interviews, narrative memos, and Site descriptions. While consolidating varying multimedia forms of data with Evernote, technological tags were applied to the notes to conceptually link items, such as critical incidents and appending media with other forms of data, including interviews, narrative memos, and Site descriptions.

Emerging from the tagged data, patterns of activity were coded, based on the ways in which they conveyed Vision Launch culture in the context of organizational development, growth, experimentation, and production as a complex, dynamic system (Callon, 1999; Fischer, 2007; Law, 1999). Codes were divided into categories that characterized procedures for designing, developing, and delivering SVGs. Throughout the entire study, data was continually coded and comparatively analyzed for its relevance to, fitness with, and opposition to emergent categories and codes (Glaser & Strauss, 1999). As a point of reference for identifying patterns, a matrix of tabulated categories and associated properties identified specific forms of evidence found in critical incidences, interviews, and other forms of data, which gave rise to these categories and properties. Eventually, themes began to emerge across the categories.

Additional codes associated with emergent themes, were defined in the form of colored cells. Themes were tracked across the data matrix by applying color fill to each relevant cell. By identifying concrete themes across categories, sub-categories, and properties (characteristics) of these categories, it was possible to visually and cognitively sort relevant, irrelevant, strong, and weak connections between aspects of professional culture, game design, production, and released deliverables. As I selected, collected, organized, transformed, compared, and analyzed data sources, the depth and ethnographic nature of my participation in the field during the first year complimented the second year goal of developing a set of higher-order themes, hypotheses, and theories that were deeply grounded in the practice and culture of building serious videogames.

Subjectivity

One key observation was that groups of informants who participated in the Vision Launch production process were accustomed to working within specific kinds of professional cultures. The Vision Launch production system appeared to present varying extremes of

familiarity within the professionally diverse group of informants. From a personal frame of reference, I have been a student for the last 25 years, so the experience of working within a complex, networked system of organizations, such as Vision Launch, and my role within this system was completely new to me. As a result, part of my experience as a participant-observer within this system was devoted more to sorting out the surface-level details of what was happening in the work around me. It was not until the second year that I began to take a more strategic approach to the selection and analysis of data.

In addition, as a doctoral student, my experience of conducting formal research and generating theory is limited to this study. While I have learned much, my awareness of the data's connection with conceptual underpinnings from other disciplines is limited. Having said that, I anticipate that the data collected for this study will continue to mature as my own professional awareness matures in the convergent fields of instructional design, game studies, and science and technology studies.

Results

Because of the rich profundity of this data set, I identified four core themes to organize these results. In determining the themes to be addressed, I applied several parameters. Themes that related most directly to the research questions of the study were identified. Of these relevant themes, those that most fully illuminated the relationship between Vision Launch culture and production process were selected. Narrative vignettes; illustrative words, phrases, and sentences from interview transcripts; critical incidences and events; and contextually relevant email discourse were selected on the basis of their capacity to clarify and convey the relevant connection between themes and emergent data. Pseudonyms were used for all informants whose quotes were included in this report, and I slightly revised some phrases in order to keep

confidential information anonymous. Modifications to text were signified by [brackets], and member checks with informants have confirmed that these modifications did not alter intended meaning. The results have included four themes, regarding the influence of Vision Launch culture in the process for producing serious videogames.

Theme 1: Complexity as an integral feature of the Vision Launch system

During its first three years, Vision Launch was involved in a range of minor and major events, which have contributed to the understanding of its nature as a complex culture system of constant growth, development, and improvement. Within the Vision Launch team, groups of smaller teams existed with varying roles and functions. Members of the education group from Site C were involved on a daily basis through the application of Agile Scrum procedures. The strategy consultant from Site C worked with the 21st century skills SME of the education group, who was most active as a member of Site A; however, this member's role was that of an SME. The team of SMEs and support staff from Site B did not consider themselves to be members of teams from Sites A and C, but rather, members of the education group in general, who provided expertise in elementary education from a variety of domains.

Table 12 has presented a timeline of critical incidences and events, which wI derived from observations, informal discussions, and individual interviews with informants (highlighted in red in Figure 8). At the start of Year 3, in May 2010, the "company relieved top 2 VL execs of duties & dissolved VL for 48hrs; VL exec producer & education director appointed as new VL leaders; VL group migrated from one division to another division of company" (Table 12). As a business entity, the corporate restructuring experienced by Vision Launch employees was powerful, and reinforced that although Vision Launch was a team with a unique and socially

constructed identity, it was also a business entity, mediated by the power of a Fortune 500 corporation.

Observed in one visit to the corporation's facility, a second visit to a different corporation's facility, and through an extensive review of documentation of company history, collaborative work typically occurred within a complex, networked group of diverse experts in fields, such as marketing, business development, engineering, environmental design, animation, architecture, and philanthropy. Executives reported that the company's decision to form the learning group appeared to be an experimental one, in which they were charged with the task of leveraging education for the sake of wholesome entertainment, like broccoli for chocolate, reported by the SME project manager as one way in which the executive producer characterized the aim of the project. In other words, the nutritional value of broccoli represented the positive value and enrichment of educational content, which was thought to enhance the nutritional value of enjoyable games, represented by the decadent, widely savored flavor of chocolate. All interviewees reported that the aim was for children to be able to always choose games that were both fun and educational, rather than having to make a choice between playing a fun game and an educational one.

Confirmed in interviews with Vision Launch executives and in PowerPoint presentations designed for presentation to potential clients, Vision Launch was at once a team, an organization, and a commercial business entity that offered the flagship service of innovating new ideas, methods, tools, and commercial products that aimed to leverage the joy of digital and non-digital play for the genuine enjoyment of experiential learning among children. Characterized in Table 12 and drawn from a synthesis of interview data and observations, the Vision Launch team's initial objective appeared to be to build a conceptual prototype of a videogame, an SVG,

designed to facilitate experiential learning through digital game play. Based on observations of the quality of the pilot prototype and inferred from the early involvement of a professional videogame development company, it appeared Vision Launch infrastructure was built upon a sufficient fund of corporate resources and financial support in its aim to build and deliver a "triple A" (Deuze, 2007) caliber videogame. In addition being, "beautiful," as one Math SME remarked during the unveiling of the prototype, the SVG was intended to be rich with opportunities for learning K-5 concepts in Science, Mathematics, Art, Language Arts, Music, and Social Studies within the context of a videogame environment that was visually and experientially delightful, endearing, and relevant for elementary age children. Signified by what SMEs referred to as the "death of [Rio]," one of strategy consultants explained that the pilot prototype had to be "shelved" due to a sudden lack of corporate financial support to continue the project, which happened several months after the initial prototype was unveiled to team members of Site B in May 2009.

The education director reported that to achieve prolonged sustainability, Vision Launch would have to engage in the constant pursuit of internal contacts across all divisions within the company. As a result of these efforts, in February 2010, Vision Launch acquired a new internal client for which the team produced a series of mini-SVGs that would be integrated into an existing massively multiplayer online game (MMOG), referred to as PlayWorld.

Despite the adverse effects of the unanticipated conditions of employee re-structuring and stringent budget cuts, team members forged countless SVG prototypes, and during Year 3, observed in emails among team members, the team witnessed eleven of its mini-SVGs "go live" in PlayWorld. With the reported and witnessed application of Agile Scrum methodology, the

executive producer trained and led Vision Launch to quickly and consistently produce SVGs, mini SVGs, and countless artifacts on in two-week cycles of production throughout Year 3.

As a highly complex system that aimed to frequently innovate new products as part of its strategy for sustainability within a constantly changing corporate infrastructure, Scrum appeared to be a fitting selection of methodological frameworks for production. Given the team's sustained productivity, its improvement in performance, and the discovery that Scrum's fundamental tenets emerged from the data as themes that characterized the relationship between Vision Launch culture and production, the three remaining themes represent components of the Vision Launch culture system that led to its sustained and projected trajectory of success over time.

Theme 2: Transparency of activity and perspective as a fundamental tenet of the system

Patterns emerging from interview data, field notes, and photographs from Site A indicated that transparency was highly valued in the emergent Vision Launch system. According to Schwaber and Sutherland (2008), "transparency ensures that aspects of the process that affect the outcome must be visible to those managing the outcomes" (p. 2). In the context of Vision Launch's approach to Scrum, Daily Meetings, described by team members as the daily "Stand Up," were conducted differently between the game development group at Site A and the software development team at Site C, even though, Stand Up occurred during the same time frame (Monday through Friday; 9:15am - 9:30am Pacific Standard Time; 11:15am – 11:30am Central Standard Time) and space (Skype online videoconference, administered via computers stationed at Sites A and C).

Observed in four Stand Ups within the physical space of Site A and confirmed in interviews with game developers, the game development lead, the executive producer, and the

instructional designer, each team member of the game development group from Site A and the software engineering group from Site C was expected to give a brief status report on his or her progress and next steps for task completion. As the Site C instructional designer reported, team members from Site C remained seated throughout the Scrum Stand Up. Team members at Site C included software engineers ages 35 and above, whose collective maturity level, work atmosphere, shared professional respect, years of experience, and engineering mindset were likely to have contributed to the group's construction of a less constricted, less managed Stand Up experience when compared with that of executives and game developers at Site A.

Drawn from field notes and reflective memos, the game development group's approach to Stand Up was performed such that team members stood up during the meeting, and decided upon by the game development team, team members were expected to do push-ups for every minute they arrived late to meetings, making patterns of unacceptable behavior visibly obvious.

In addition to the emergence of tardiness rules that supported the construct of transparency, such as push-ups, the executive producer reported his expectations for all team members, especially those of the game development group. These included "ownership" (accountability) of tasks; the completion of "small chunks" of tasks every day during each consecutive two-week Sprint cycle; "transparency" through "visual broadcast," effective planning during "retrospectives;" punctuality and progress during Stand Up; strategic prioritization of tasks ("pointing"); realistic awareness of personal abilities; and a commitment to the philosophy to "always be shipping" (Vision Launch Executive Producer, personal communication, November 11, 2011). By explicitly training team members to understand the meaning of these expectations, perform work in accordance with them, and comprehend the meaning of three core Scrum roles (Team, Scrum Master, and Product Owner), Vision Launch

executives managed the production process through the operation of organized, independent teamwork. As reported by the executive producer and the game development lead, the result was that in instances when executives or managers were absent from the office and engaged in other activities, such as business development trips, the team was able to meet group expectations and goals.

Witnessed in practice and reported by most SMEs as one of the most crucial activities they completed in preparation for working with game developers, a seminar on the Vision Launch approach to game design appeared to prepare SMEs of Site B for understanding more about and making more transparent the work experiences of the game development group at Site A. The SME project manager, instructional design apprentice, and two game SMEs facilitated a seminar in which four teams of 2 – 3 SMEs were taught and asked to apply game developers' "top down" and "bottom up" approaches to envisioning, articulating, developing, and delivering game concepts that adhered to the Vision Launch mission to create games involving experiential learning. SMEs reported that by making more transparent the process of game design, it became easier to provide learning-oriented feedback in consideration of game mechanics.

On one hand, it appeared Vision Launch leaders were in favor of approaches that exposed team members to all aspects of the team's operations. On the other hand, geographic distance and technologically mediated discourse hindered the transparency. Located roughly three thousand miles apart, communication between Sites A and B happened weekly between the SME project manager of Site B and education director of Site A in the context of a weekly telephone conference for the facilitation of status updates and other management duties. Game developers and the education director of Site A contacted individual SMEs with varying degrees of frequency, depending on which games were in development and in need of greater depth of

expertise. Over the course of a couple of months, one game required daily and weekly email exchanges between an artist-engineer and one Art SME. Social Studies SMEs, however, were rarely contacted, since the games in development did not require their input at the time. These examples were evidence that the frequency of contact between game developers and SMEs was dependent upon the content of the game being produced. Additionally, it was found that greater transparency was possible when SMEs were able to work face-to-face with game designers at Site A.

Theme 3: Adaptation as a fundamental skill among all team members within the system

Defined by Schwaber (2004), Scrum was founded on the concept of "empirical process control," which appeared to diversify hierarchical power structures and mediate the construction of the Vision Launch team by promoting team members' frequent practice of inspection and subsequent adaptation in the context of the Scrum framework. For example, during an executive review (iterative feedback cycle) of game design concepts, prototypes, and progress, the official tasks of executives were explicitly defined in one of the production documents as, "determine if the game aligns with Vision Launch goals and whether or not it is commercially viable," and "facilitate discussions with the concept designer to review goals and viability."

The process of making decisions about whether or not the game "aligns with Vision Launch goals" and "is commercially viable" was an activity that I observed in the game development room at Site A, happening in the form of an informal conversation among 2-8 team members. At spontaneous moments throughout the day and week, game designers, who were participating in two-week Agile Sprint cycles of rapid production, would walk down the hall (20 feet or so) to the executive producer's and/or the education director's office and request that one or both would "come take a look at something." Game designers would return to their

computers, followed by the executives, who would stand behind the artist or engineer (both considered game developers and both considered designers), watching, responding to questions, or making suggestions.

Based on an analysis of observations of practice and drawn from interviews with the education director and game developers, it appeared that a number of team members could accumulate during informal cycles of review, depending upon who was available upon request and who might have been listening from another seat in the room (game developers, game development manager, executives, education strategist, instructional designer, or me, in this case).

The most common points of one-on-one contact for the game developers included each other, the executives (producer and education director), the game development manager, the instructional designer from Site C, and the curriculum SMEs, who reviewed game prototypes and concepts at the end of each two-week Sprint cycle in a technologically mediated online discourse context. Based on reports from bi-weekly Sprint Review meetings, changes to game mechanics and evolution of game concepts culminated in the form of fully functioning wireframe games and prototypes, which were stored in and retrieved from the team weblog and further reviewed and discussed among team members during Sprint planning and early stages of upcoming Sprints. In addition, changes to production practices were also reported during Sprint Review, Retrospective, and Planning meetings and disseminated via email, the team weblog, and in meetings observed at Site B.

Theme 4: Empirical inspection as a fundamental skill among all team members within the system

Schwaber (2004) has characterized the concept of inspection within the context of Scrum as an empirical one that requires tactical inquisition. According to the Scrum framework, components of the production process "must be inspected frequently enough so that unacceptable variances in the process can be detected" (Schwaber & Sutherland, 2008). Informants appeared to be most closely tied into production through critical instances of design, which were also critical opportunities for the facilitation of empirical inspection.

In other words, planned phases of design in production brought about the organization's valued condition of transparency, which made inspection more frequently and adequately possible during these critical instances. Activities of design in production were categorized into these levels: (1) envision, articulate, develop, and deliver preliminary game concept; (2) compose concept design document and engage in iterative feedback loop; (3) compose technical design documentation, content map document, and define other technical needs; (4) develop, evaluate, and modify prototype and game, based on game concept; and (5) reflect upon, evaluate, and aim to improve team performance

Level 1: Envision, articulate, develop, and deliver preliminary game concept

Drawn from interviews with strategists, game developers, and the executive producer, Level 1 of Vision Launch's game design process appeared to emphasize the collective and collaborative practices of envisioning, articulating, developing, and delivering preliminary game concepts that would eventually enter the Scrum process via Sprint planning. Drawn from the interviews with the executive producer and one strategy consultant, I perceived the initial task of innovation as a process of envisioning, articulating, developing, and delivering an idea to an audience of stakeholders.

Taken from an individual interview transcript, the relationship between the creative process of design and Scrum has been most concretely and cohesively described in the following passage:

> Well, Scrum is just a tool, so the game design process is completely orthogonal to it. They're not the same thing. So the game design, in fact, you'll have stories inside a Sprint that are game design stories like, "we needed to [do x, y, z]" or "pre-production. And so the game design process, it depends on what kinds of games we're talking about. Because we're doing games in [PlayWorld], we're doing it with a phased approach, so phase one is what we call a Stealth, where we make no consumer-facing changes to the content, and we just map [the game mechanics] to whatever [learning mechanics are] opportunistically there. Like in [Game 1], you have to count the certain number of [croutons] on your [salad], so there's a very small exposure to counting, there. So for that, there is no game design. That's really just instructional design and building a content map But then there's phase two, which is taking the existing game and adding new levels or new modes to it. And that starts with a brainstorm, it could be an hour, it could be four hours, where we pick a game that's in [PlayWorld] and we say, okay, what kind of game can we make, what kind of new mode or levels can we add to this that are specifically focused on learning. (Vision Launch Executive Producer, personal communication, November 11, 2010)

The initial task of envisioning, also referred to as brainstorming and ideating, game concepts and the iterative stages of articulating and developing these concepts occurred outside of the framework of Scrum. Three artists, two engineers, the executive producer, the game strategist, and the recently hired game development manager, reported that during the brainstorming process, they each began with one of two distinct design approaches, referred to as "bottom up" and "top down" design. These processes were not in any way recognized as scientific procedures, but they occurred within a known set of design constraints that included the strategic bottom up and top down approaches, along with a specific type of game to be designed for specific types of technological systems.

In the bottom up approach, designers' task was to, first, envision and articulate new or seemingly new ideas during "pre-production", or Level 1, and second, develop the game idea from the bottom up by incorporating relevant learning concepts, drawn directly from the Vision

Launch curriculum content. In the top down approach, designers' task was to, first, view areas of the map that piqued their interest and ones that "haven't been touched yet," which meant specific content from one or more of the six curriculum domains that had not yet been incorporated into any of the games produced or in production.

At one point, the SMEs of one domain became increasingly concerned and even expressed frustration that of six domains, their representative domain had not yet appeared in any of the games they had designed. During a timely interview with one of the game design strategists from Site C, I asked whether this particular domain might be up for consideration in the next round of pre-production, to which the strategist explained that because it had not yet been addressed, it was certainly "fair game" for consideration in future iterations of design.

Roughly three weeks later, SMEs exchanged a number of emails, expressing their excitement about the appearance (during the bi-monthly education review) of two wireframe games that directly "hit" the curricular content of the previously untouched domain. As designers studied the acutely defined content of the curriculum maps, their aim was to envision, articulate, and develop game concepts from the top down, inspired directly by the content.

Emerging from interview data and Sprint Review documentation, Table 13 presents one way in which the game development team distinguished between three types of games, referring to them as Phase 1.5 Games, Phase 2 Games, and Phase 3 Games. These game types emerged from a context in which the team was (a) commissioned to create mini-games and other player experiences (b) for an existing MMOG (c) that had commissioned the team to integrate learning content into PlayWorld or create new PlayWorld SVGs, mini-SVGs, or other learning environments to be implemented within the existing play community.

Table 13 Classification of Game Types, Adapted from Sprint 7 (of 25) Meeting Notes

Game	Derived objective	Source: Notes from early Sprint Review (no. 7 of 25)

Gen 1.5	For clients' existing MMOG mini-games that are played live in the online space, game developers compose content maps (Step 7) that align game mechanics with learning content	Phase 1.5 Games: Map existing games to [curriculum map]
		• NOTE: As a bonus objective we are also mapping these games to [educational content]! Check out the content maps for more info.
		  o [Game 1]
		  ▪ Passed QA!
		  ▪ << File: [Game 1] content map.pdf >>
		• [Game 2] (NEW)
		• << File: [Game 2] content map.pdf >>

Gen 2.0	Game developers create new levels and modes of play as additions to clients' existing MMOG mini-games that are played live in the online space, along with appending content maps that align game mechanics with learning content	Phase 2 Games: Add Learning levels/modes to existing games • NOTE: As a bonus objective we are also mapping these games to [curriculum map]! Check out the content maps for more info. • [Game 3] [New] Mode • Added [new] power up [mechanic] • Added [new challenge] (increases per level) • <<[Game 3 design document].pdf >> << File: [Game 3] Feature List.docx >>
Gen 3.0	Game developers create new mini-games for play in a live, existing MMOG, along with appending content maps	Phase 3 Games: New Games with Existing Contexts • [Game 4] • Now has 3 levels • Added instruction and intro screens • For now you will need to click on the [object] to get [it] to move (temporary) • NOTE: This will be submitted for approvals in Sprint 9

Note: In addition to an analysis of meeting notes from Sprint 7, email content and interview data showed a shared distinction (among team members) between these different types of games. Because there are a number of procedural stages, steps, processes, and phases involved in production, I replaced the word, "phase," with a more specific modifier, "generation," to avoid confusion throughout theory development.

Note: The use of a fractioned number, 1.5 in Generation 1.5, is reflective of the game development group's shared terminology and is meant to signify that in the context of outsourced MMOG game development, developers begin by working with Generation 1 games. No new game mechanics are added to the player experience in Phase, or Generation, 1.5 games.

Level 2: Compose concept design document and engage in iterative feedback loop

Once a designer was able to complete all tasks from, what I have referred to as, Level 1 of game design, the game design concept document was sometimes disseminated, via email or on the team weblog, and at other times, it was not disseminated. Given that the Agile philosophy favors goal achievement and end results over heavy documentation (Beck et al., 2001), it did appear that the creation of formal concept design documentation was inconsistent. However, as the executive producer explained, some of the design documentation did appear in designers' weekly Stories, visible in the context of the Sprint Release Backlog, which was often photographed or digitized and uploaded to the team website.

When concept documents were created, designers disseminated them to executives, game developers, strategists, SMEs, system engineers, and instructional designers, who provided feedback in various forms, including face-to-face conversation among game developers and online discourse in the form of third-party translation between SMEs and game developers. Each form of review described in Table 14 operated as needed in an iterative cycle of communication.

Table 14 Categories of Iterative Feedback and Member Responsibilities

Type of feedback loop	Responsibilities
Executive Review *Executive producer* *Education director*	• Determine if the game aligns with Vision Launch goals and whether or not it is commercially viable. • Facilitate discussions with the concept designer to review goals and viability.
Education Review *Strategists* *Instructional Designer* *Subject Matter Experts*	• SMEs evaluate the learning potential and measurability of learning by identifying specific educational content addressed in the game. • SMEs identify all relevant domain topics and share ideas about possible ways in which the game could be slightly modified to more directly "hit" educational content. • SMEs and the instructional designer provide appending content (imagery, analogies, etc.) as a resource help to frame learning concepts. • The instructional designer and strategists facilitate discussions with the concept designer to analyze the SME feedback.
Game Review *Game Developers* *Strategists*	• Determine if game concept is fun, innovative, and technologically feasible. • Facilitate discussions with the concept designer to review the fun factor and technical feasibility.

Based on feedback from three different forms of review, game developers modified concepts to incorporate the feedback. The example that follows characterizes the way in which the team continually reviewed the educational validity of its game concepts and prototypes through an iterative feedback loop between SMEs of Site B and game developers of Site A. To clarify the role and responsibility of executive leadership in this education review process, the education director traveled to Site B to meet with SMEs once every six weeks and always on Friday at the end of game designers' Sprint cycle. The executive producer had not visited Site B, since that was considered the management or leadership realm of the education director.

During SME meetings of 2-4 hours each, the education director engaged the group of 10-15 participants in a collaborative feedback session in the atrium at Site B. At this time, the SME project manager played the game prototypes and SMEs responded, while I typed meeting notes. At the end of these sessions, the feedback for each prototype, from each SME, was edited and compiled into a single Microsoft Word document and then, emailed to the education director, who modified the document and added additional comments if needed. Here is a list of comments from an "SME Sprint Feedback" document for one of the games in production:

- Math: concerns moving shapes in space using rotation and translation (Rotation); The [object] (or a smaller version of it) should stay visible for the lower levels.
- Art: I like that the [object completes a specific function] because it requires the player to pay attention and remember . . . but I think it would be very helpful to players to have a "hint" option where they can see the [object] again for a limited time period if they need to refer it again.
- General comments from ELA SME: Prompt said, "Select a puzzle" but there were no puzzle options that appeared. I went ahead and hit "start" and got to the [next screen]; The "feel" looks intuitive and should appeal even to the younger players. I like the new look. The new controls look like they will give a better sense of [how to win] by seeking the just right position on the shift/bar & otherwise adjusting [objects].

By noting the content that the game "hits," the SMEs helped to keep the game development team "in check" or "keep them honest," regarding the extent to which each game

appeared to have integrated learning into it. As shown in the phrase "looks intuitive and should appeal even to the younger players," SMEs were also responsible for gauging whether various game features ("the feel", narrative, interface, etc.) and mechanics (activities players do during play) were appropriate for elementary age children.

In situations that required greater expediency, these forms of review were completed during and beyond prototype development (Levels 3 – 6) during iterative Sprint cycles. The activities of critical analysis among all team members, the responsibilities of reviewers, the facilitation of feedback-oriented discussions or communication between reviewers and designers, and designers' modification of game concepts and prototypes to suit the socially and strategically generated criteria of three kinds of reviewers (executive, game-oriented, and education-oriented) supported what appeared to be the collaborative process of inspection, or detection of "unacceptable variances" that would need to be modified or adapted.

Level 3: Compose technical design documentation, content map document, and define other technical needs

Based on processes charts gathered from the team weblog, game engineers and artists of the game development team appeared to compose technical design documentation, which articulated technical, design, and art requirements for game production. However, from interviews with game developers and the executive producer, it appeared that heavy, formalized technical documentation was not commonly practiced. Instead, carefully and simplistically composed "small chunks" of Stories emerged as the team's core documentation strategy. Stories were collections of related tasks to be composed and completed by team members during each workday of a two-week Sprint, and each one was written on a yellow Post-It note and prioritized, or "pointed" (assigned point values). In addition to being displayed across the walls of the game

development office in a linear, temporal progression (which served as the Sprint Release Backlog), team members photographed or typed the Sprint Stories and then uploaded to the team weblog. At the end of each Sprint and before the start of the upcoming Sprint, Stories were re-written, re-pointed, and re-aligned to suit the needs of the Sprint Release Plan during a rigorous and lengthy Sprint Planning Meeting, which occurred every other Friday afternoon.

In addition to integrating the technical labor needs of game design and development, the technical needs of instructional design and development was also needed in the form of concept map documents, which were created for each game. In the description of game types from Table 15, the summary of one Scrum Review reads, "As a bonus objective [of Phase 1.5 games], we are also mapping these games to learning [content]! Check out the content maps for more info." Over time, each game had a single, appending content map that visibly highlighted the learning content emphasized in that particular game. Each content map could be modified, based on the game for which it was developed.

During this process, the instructional designer, engineers, and SMEs were continually responsible for contributing additional information to support the instructional design decisions of the game development group as needed. As with wireframes, prototypes, concept design documentation, and process documentation, concept maps were also uploaded to he Vision Launch weblog, which appeared to be a critical source of information and reference for the team as a security-enabled repository.

Level 4: Develop, evaluate, and modify prototype and game, based on game concept

When Sprint Stories were adequately articulated and pointed, artists and engineers collaborated to produce an interactive prototype or demo of the concept, which appeared via email and on the team weblog as a digital storyboard or wireframe. The education director reported her role as a source of educational intervention during Level 4 of game design, in which she had developed the custom of encouraging game developers to consult with education experts throughout the making of their games.

After designers had interpreted SME feedback from the bi-weekly SME Sprint Feedback document, they would occasionally contact SMEs via email or by telephone for further clarification. Table 15 presents an email exchange that occurred between two designers and one of the Music SMEs after designers had contacted the Music SME for a telephone conference. In this instance, the "possible game flow," or interaction between the player and the game, was negotiated between game developers and the Music SME.

Table 15 Email Between Game Developers and Music SME

Day/Time	Sender	Email content
TH, 4:29pm (3:29pm CST; 1:29pm PST)	artist-designer to Music SME; CC: engineer-designer executive producer, education director	Great talking with you, here's a refresher of the topics that we covered in the call and your action points: [deleted email content] If there are any particular sound cues for beginning the rhythm patterns that are preferable or come to mind to better enhance the game please do share! Much thanks again, it's fantastic to have an expert on board for this kind of thing!
FRI, 9:21am (8:21am CST; 6:21am PST)	Music SME	Everything I click responds with a hesitation of about an eighth or sixteenth note off (never mind if you're not a musician, it's a slight delay that you'll hear if you try to "clap" your mouse button with the beat). So I'm wondering, what is causing the hesitation? I have a couple of guesses, but you folks will need to dig in to verify before we go further. [Music SME lists 3 suggestions] Without the ability to accurately hear that what I'm clicking matches with

		the beat of the loops, we'll have to rethink the mechanic, I'm sad to say. There still may be ways to pick some patterns that don't need to be rhythmically synced, but then we're doing something that isn't rhythmic listening and performance. We'd simply be pattern matching, based on aural cues. That's not a bad thing, but it's not a good as it might be if we can solve this problem. Let me know what you find out.
FRI, 12:28pm (7:28am PST)	engineer-designer	I understand what you are saying about the delay for sound effects. 1) I checked the sound files and none of them have any silence in the beginning of any of them so that part is good. 2) The signal is given to play the sound immediately when the button is pressed, but this is probably where the delay is. 3) It's not your computer because the delay is experienced on other computers. In conclusion: It's something we are aware of. I think the delay is caused by the sound file needing to be loaded, and I'm going to look into fixing that. Whatever the problem is, we plan on fixing it, so we can just keep working on our current plan.
MON, 2:02pm (11:02am PST)	engineer-designer	I was doing some more work on the issue and the final delay we are hearing I'm pretty sure is an operating system issue - meaning that there is a delay in Microsoft Windows but there is not a delay on a Mac. So, we have a couple of options. 1) Go with the current setup (and I may not be able to get the delay in the actual game down to the test swf I sent earlier today.) 2) We set up the sound effects to loop like the drum/bass lines and just mute and unmute the sound effects. (Unfortunately, this would require that the new sound effects to be just a single constant tone, but it would give us on beat gameplay.) What do you think?
TU, 7:21am (CST)	Music SME	OK – [deleted text] Let me think about this some more, and play around with the loops/effects. It may be that imprecise effects don't need to be heard exactly on the beat, but we'd still want to judge that the mouseclick happened precisely with the bass/drum loops. Or, there may be some short duration sounds that we could put into a muted track and unmute on the click. However, I don't think one single tone would do it. Musical sounds have attack and decay properties, and I worry that those would be lost if we go with your #2, unless we're very careful with what we choose as the sound effects. I'll be back with you tomorrow, as I need to teach a class today. However, given my obsessive thinking, I'm sure this problem will be dogging me in my sleep :) Thanks for your work on this, [engineer-designer].
TU 8:31am CST (6:31am PST)	engineer-designer	Thanks for your help, too! Since the timing for the effects is off beat, I wonder if it would be beneficial to see if the mouseclicks are synced with the beat, because as you

		mentioned earlier, you tried to compensate the timing of your clicks so that the sound effect would be heard on beat. We may be able to mimic the attack and the decay of a tone by adjusting the volume instead of mute/unmute? Let us know what you come up with :o)
TU,11:29am CST	Music SME	It would absolutely help to see if we can get an algorithm that [functions in a specific way]. I've done something like this once long ago. It involves knowing [several measures]. Send me something to test, if you'd like.
TU,11:31am CST (8:31am PST)	engineer-designer	Yeah, I can do that! I'll work on it now and send it to you when I'm done.
TU, 3:57pm CST (1:57pm PST)	engineer-designer	Can you check this out? It calculates the cpm (clicks per minute) on the button.
TU, 2:18pm CST (12:18pm PST)	Music-SME	Wow - this will work as far as processing my clicks in tempo. Glad musicians aren't computers, or audiences aren't either. I'll go ahead and produce some rhythm levels tomorrow, and we can see what happens with the sound delay.

Complimented by the on-going, technologically mediated conversation with the Music SME, the engineer-designer's technological exploration in game engineering was dependent upon a variety of factors, including system discrepancies between the game's performance on Mac versus PC computers and on the approach to leveling the game in educationally appropriate ways.

Throughout the engineer-designer and Music SMEs email exchange, they were able to continually modify the game in ways that improved the performance of the game mechanic and created a greater degree of depth and relevance from the standpoint of the Vision Launch Music curriculum, which was available in the form of an organized chart. Rather than generate additional supplementary documentation to support the restricted language of the curriculum map, as the instructional designer had more than once done for the Science domain, the need for

the Music SMEs expertise in the form of online discourse and telephone conversation was favored. In this instance, the iterative, primarily online communicative exchange between the Music SME and game developers grew into a collaborative form of strategic inspection, experimentation, and adaptation.

Level 5: Reflect upon, evaluate, and aim to improve team performance

Exemplified in the team's meeting notes from the Sprint 1 Retrospective in Table 16, the game development group engaged in rigorous planning meetings in between Sprints that involved structured group reflection about their own performance during Sprint 1, along with critical decision-making about tasks to be completed during the upcoming Sprint, visually broadcasted as smaller parts which make up a collection of larger stories.

Table 16 Notes from Bi-Monthly Sprint Retrospective Meeting Among Game Developers

Reflection questions	Synopsis posted to the game development group website
What went well?	• Solid velocity even in the face of major business changes and significant travel distractions. • Better integration of distributed team (introducing [Site A game dev team] to Science SMEs) • Good level of collaboration, transparency, visibility. • Great Scrum Master!
What did not go well?	• 'The Nuclear Bomb'. Major business re-org, lost key stakeholders/scrum members. '[Executive producer] lost his boss'…under great stress, distracted. Makers also very distracted/scared. • Highly inconsistent Stand-Up adherence (SM + PO were the only consistent attendees) • Poor Stories: Lots of small Stories (almost Tasks really). Need better Acceptance Criteria. Poorly written Stories.
What should we do differently?	• *Layoffs/Re-org:* There is nothing that anyone could have done to prevent this. It is important to note however that the team remained focused and on track despite these changes and that having a framework like Scrum with its daily rituals and visual organization was a great bonding and focusing element for the team(s). • *Standups:* Everyone simply needs to commit and follow through with the Stand Up ritual for everyone's benefit. • *Stories:* Well-crafted Stories are the foundation of a successful Sprint. Make more of an investment during Sprint Planning to write user-centric stories *with* complete Acceptance Criteria. Scrum Master needs to be more aggressive about enforcing this. Product Owner needs to be more responsible

	in this area.

Note: The content from this table was copied directly from a narrative post collected from the game development website.

Typically facilitated by the team's Scrum Master, team members discussed, during the Sprint Retrospective, what went well, what did not go well, and what should be done differently in the future, regarding its application of Scrum within the context of Vision Launch aims, expectations, and design needs. Table 16 shows that early on in its application of Scrum, the game development group's collaborative inspection of its own performance during the two-week time period of the Sprint grew into a concrete set of solutions for ways of improving upon its process for the next Sprint.

Based on this document, retrieved from the team's weblog, the team recognized that it needed to "make more of an investment during Sprint Planning to write user-centric stories *with* complete Acceptance Criteria," by having the Scrum Master "be more aggressive about enforcing [user-centric stories that have complete Acceptance Criteria]" and the Product Owner "more responsible in this area." Not only were problematic issues identified, but potential solutions were suggested and implemented by defining who would be responsible for behaving in specific ways that were expected to rectify the problem, such as the Scrum Master's assertiveness ("aggressive") and the Product Owner's accountability ("responsible"). Vision Launch Retrospectives helped to facilitate innovation through the team's collective inspection of performance, individual self-awareness, problem solving, mediation, and adaptation.

Discussion

Following its two-year infancy and 48-hour corporate restructuring, Vision Launch further defined its shared vision of providing learning content and opportunities for diverse franchises and facilitated it with the implementation of an Agile (Beck et al., 2001) Scrum (Schwaber, 2004) methodology. Throughout this study, Vision Launch endured and thrived in the adverse conditions of a high stakes corporate environment as an adaptive, yet highly structured and indoctrinated system in which design teams collaboratively followed iterative processes and made goal-oriented decisions that were based on the creative, intuitive, and vision-driven integration of performance-based play and experiential learning within a collection of SVGs that were delivered to children within the PlayWorld MMOG.

The Vision Launch production team's structured approach to "phased" SVG design and "time-boxed" production was helpful in the context of this ethnographic and grounded theory inquiry because it provided a firm conceptual lens for interpreting trajectories of team performance. Manifested in forms of team performance (collaboration, task completion, decision-making, beliefs, attitudes, etc.) within the context of empirical process control (Scrum), the Vision Launch system gave rise to a socially constructed commitment to facilitating the transparency of workflow and adaptability and empirical inspection in workflow. Results showed sufficient fitness between conditions of the Vision Launch system and values, behaviors, and attitudes embedded within the cooperative frameworks of Agile and Scrum.

The performance of Agile-based Scrum methodology generated evidence that Vision Launch operated within a participatory context that was ingrained with a core vision and set of values as a strategy for defining work activities, and productivity was dependent upon the treatment of team members as sentient human beings. Vision Launch was an experimental

system (Callon, 1999; Fischer, 2007), entrenched in a culture that reinforced its functional solidarity and strength through the process of achieving team goals.

Transparency of the Site A Stand Up, for example, yielded increased efficiency and effectiveness of the production process through this series of events: (1) team members identified a problem (fellow teammate, who was not meeting strategically and socially constructed group expectations) and consulted with each other about the course of action to be taken about their teammate's inclusion in the group; (2) team members consulted with the education director, who encouraged them to consult with the final decision-maker, the executive producer; (3) team members and the education director consulted with the executive producer, who made the decision to remove the problematic team member from the group and hire a new team member, who could achieve the expectations of the team. By integrating the value of transparency via the Scrum framework, Vision Launch as a socially and strategically constructed culture system was able to enforce an overtly defined criterion for the inclusion and exclusion of participating team members, which ultimately contributed to what was confirmed by leaders and game developers as an "empowered" game development team.

The systematic, yet exploratory nature in which game designers approached the design of SVGs reflected the empirical nature of the Scrum framework, since it required designers to inspect and adapt to design constraints, or acceptance criteria, which were defined by a variety of factors, including needs for consumer-facing changes, client satisfaction, and fulfillment of Vision Launch mission and corporate charter.

The Vision Launch system

Within the first six months of fieldwork, it was evident that continued growth and change were common features shared between Vision Launch and Law's (1999) interpretation of

technology as a system. Law (1999) explains, “because actors or components in a system are functionally related, changes in one or more cause imbalances or reverse salients in the advancing system from until the other components cascade and adjust to achieve an optimal interaction” (p. 13 – 14). Even in cases when Vision Launch executives were perceived to have receded from the production process for varying time periods, the team’s ability to learn and adopt Vision Launch’s unique practice of Agile-based Scrum in their design and development activities helped to sustain the “dynamic equilibrium” (p. 14) that the Vision Launch system continually sought to achieve.

Founded within a high stakes corporate business environment that afforded severe extremes of financial and emotional risk and reward, the Vision Launch system grew in its ability, over time, to stabilize the dynamic processes of its system. The solidarity, or state of oneness that produces and is based on community, interests, objectives, and standards (Solidarity, n. d.), of the Vision Launch system was reinforced by its apparent capacity for dynamic resilience.

When viewed in the context of Scrum, the shared culture system (Fischer, 2007) of Vision Launch became increasingly visible, given the shared commitment to transparency of process. Conditions of influence, such as team members’ growing ability to adapt, appeared as the team mediated power and responded to changing conditions throughout the strategically defined game design and production process. Human conditions that encouraged cohesion and oneness among team members, such as shared attitudes, values, and beliefs, also appeared to shape the criteria for cultural membership. For example, all informants expressed a shared professional vision that learning is inherently fun when it happens organically in one’s experience and interaction with the world, and the belief that they, as a team, could design and produce genuinely fun learning

experiences, based on their shared vision about the inherent joy of learning through experience. The design and production of serious videogames was grounded in the values and beliefs of the Vision Launch workforce.

Team members' shared vision and Agile-inspired ethos continued to take shape over time within a cohesive and emergent system of SVG innovation and to be expressed in the forms of collaborative interaction, creation, resilience, adaptation, negotiation, conflict, and technological mediation among team members on a daily, weekly, and monthly basis. Based on patterns of team performance, informants' abilities to adapt, learn, and innovate through "phased" game design and "time-boxed" production contexts led to the development of a workforce that was unified, empowered, and critically self-aware. The abilities adapt, learn, and innovate, along with the outcomes of solidarity, empowerment, and critical self awareness among workers, appeared to be conditions of the Vision Launch culture system that yielded the successful, rapid, and sustained innovation of eleven observed mini-SVGs within one year.

Despite a constant state of growth and change, Vision Launch negotiated these changes, adapted to them, and as a result, consistently displayed the characteristic of dynamic resilience and growth when presented with adverse and changing conditions. The production team was oriented toward success in the achievement of its shared vision and goal to innovate within a cooperatively constructed, cohesive, and expressive culture system. Experienced in the practical contexts of live conversation and online discourse, Vision Launch's approach to collaborative innovation, including inspecting, envisioning, experimenting, articulating, developing, and delivering new ideas, artifacts, or methods, gave rise to an adaptable, committed, empowered, resilient, critically self-aware, and collectively agile workforce.

Synthesis of theory

Based on the study of team performance and its realization of sustained success within the context of the Vision Launch culture system, the emergent discovery was that a sustainable system of SVG design and production is a business unit, an organization, and a diverse workforce that requires its workers to engage in the on-going development of skills and knowledge of how to innovate, learn, and adapt through cooperative, vision-driven, interactive, technologically mediated, and hierarchically diverse roles.

From the analysis of emergent data and conditions of influence discovered in results from the team's performance of Scrum and Agile, the following substantive theory about designing and producing serious videogames has been derived:

> Within the context of designing and producing serious videogames, the Agile (Beck et al., 2001) framework of Scrum (Schwaber & Sutherland, 2008) is fit for use within and among networked groups of people, who aim to collaboratively and strategically give rise to a complex, emergent, experimental, and transparent culture system (Fischer, 2007) that is made up of interaction among non-human components and humans committed to developing skills in innovation, learning, and adaptation for the sake of sustaining dynamic equilibrium over time (Law, 1999), or successfully sustaining the innovation of durable serious videogames and other relevant artifacts, while enduring and growing with contextually and culturally relevant conditions and forces of influence (Callon, 1999).
>
> The practices of innovating, learning, and adapting reinforce organizational fortitude, sustainability, and success within constantly shifting corporate systems. To know how to innovate in a sustainable system of serious videogame design and production means that team members should be able to, articulate, develop, and deliver new or seemingly new ideas, methods, tools, or artifacts in a variety of contexts, especially that of collaborative work. To know how to learn in a sustainable system of serious videogame design and production means that team members should be able individually gain an understanding of, produce knowledge of, develop skills in, critically reflect upon, and deal with a new or formerly new concept, resolution, method, tool, activity, situation, or artifact through inquiry, study, practice, apprenticeship, and mentorship in a variety of contexts, especially that of collaborative work. To know how to adapt in a sustainable system of serious videogame design and production means that team members should be able to continually shape, moderate, refine, and reform artifacts, environments, experiences, behaviors, and attitudes so that they are continually aligned with the persistent and evolving goals of the production team.

Throughout the on-going formation of the culture system, the team's adherence to the following rules is recommended: (a) the production team is shaped and conditioned to encourage a shared commitment to transparency of process and continued improvement of individuals' abilities to innovate, learn, and adapt through a contextually relevant implementation of Scrum methodology; (b) the functional competencies of all members of the system's human workforce include the abilities to innovate, to learn, and to adapt within a variety of communicative contexts and situations; and (c) sustainability of innovation over time is emphasized as a core value of production.

Conclusion

Within a sustainable system of innovation, especially those that design and produce serious videogames, the case of Vision Launch has shown that the workforce must be agile in its approach to handling persistent change and growth within and outside of the system. Based on observed patterns, it was determined that the creation of SVGs was poised for sustainability and success when supported by an adequate base of initial funding and managed by partnerships among leaders and laborers, who were dedicated to an overtly broadcasted vision to apply digital play in unique ways to promote children's learning through a production process that valued team visibility, adaptation, and inspection (Schwaber, 2004), along with empowerment, self-awareness, solidarity, and resilience.

At the core of all socially and strategically constructed operations and artifacts, teamwork facilitated the sustained innovation of SVGs. As an experimental system (Fischer, 2007), the rise of shared culture among team members was cultivated with the application of the Agile-based Scrum production approach. For example, in live and online spaces, field sites and informants were entrenched in communicative and collaborative interaction with each other. Both Agile and

Scrum have required and provided skeletal guidelines for how to manage frequent face-to-face collaboration in the workplace. Bound within the self-proclaimed context of Agile and Scrum, Vision Launch's conceptual formula for sustained success in innovation was its construction of a culture that was rooted in the deeply relevant work of sustainable innovation.

Further analysis of the evolving competencies and skills of team members engaged in the sustained innovation of SVGs would provide knowledge of the ways in which various forms of learning have been utilized during the process of innovation. In the context of applied practice, managers, producers, and executives might find it useful to know the ways in which the digital media workforce must learn and form knowledge (in practice) in order to achieve sustained innovation within a variety of phased or time-blocked production contexts.

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CHAPTER 6

CONCLUSION

In recent decades, the Internet has become a repository of human creation and a virtual laboratory for makers and consumers of digital media. The current trend toward open access tools and resources has further expanded the capacity for media production among digital citizens of all ages. These offerings have begun to play a part in the professional development of media makers by preparing them for work within businesses, institutions, and organizations from a broad spectrum of disciplines that aim to make use of digital media, whether it is for the sake of marketing, entertainment, military training, or K-20 education. While the ability to obtain jobs is still beyond the reach of many people in the developed world and most people of the developing world, the need for competence in the practice of innovation is evidence of an archaic and progressive zeitgeist of human creation in the early 21st century, which has been addressed in this dissertation through the study of how Vision Launch innovated a collection of serious videogames (SVGs).

With a focus on design work in the making of innovative digital media, the empirical investigation of the serious videogame (SVG) production process generated original research from a context of disciplinary convergence among the areas of education (instructional media), design (as practiced), and digital media (of the entertainment industry), which is depicted in Figure 3.

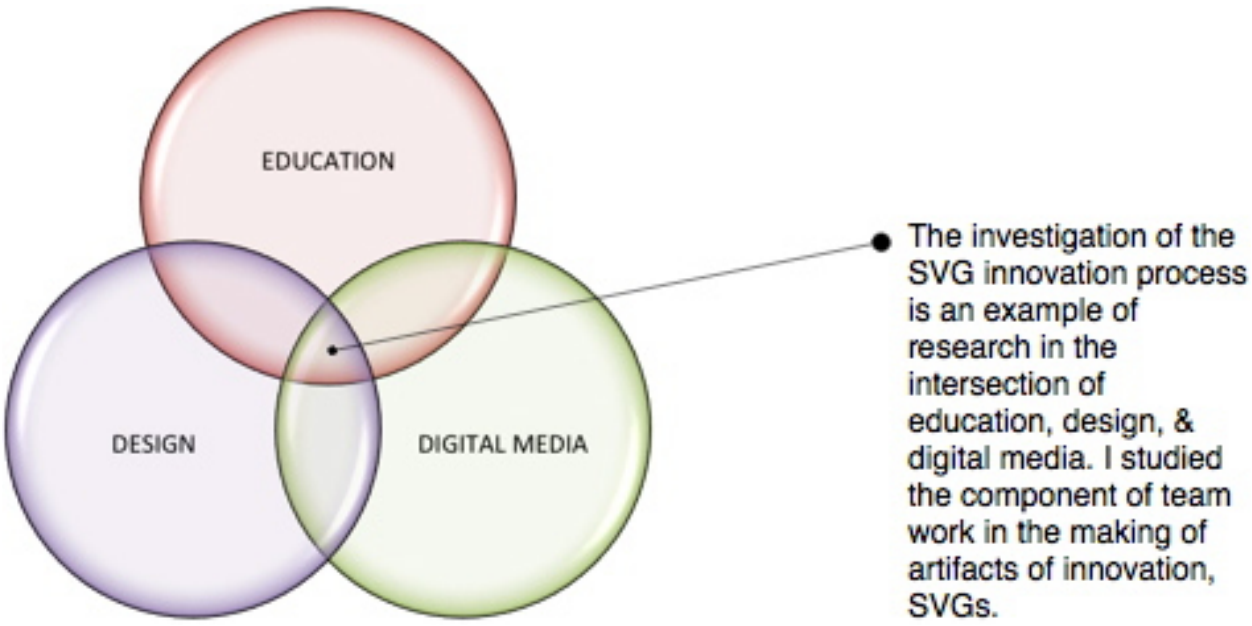

Figure 3 The Study's Place Within the Convergence of Education, Design, and Digital Media

The study presented a case in which the global economy has affected work culture among interdisciplinary laborers from the gaming industry, higher education, and business development, which operated collaboratively within a network of corporate enterprises. Not only was the investigation influenced by the cross-section of education, design, and digital media, but it also aimed to influence these areas in the context of research and practice in the innovation of serious videogames and other digital media artifacts.

Summary of findings

Vision Launch was a culture system of successful serious videogame innovation in which challenge and change (the conditions of corporate rigidity and volatility) were expected, and in which team members' growing abilities to strategically innovate, learn, and adapt elicited effective problem solving throughout the making of serious videogames. In the contexts of communication and performance, the operation and development of it's the culture system gave rise to a workforce that was conditioned to innovate; inquire; negotiate, articulate, and create

meaning; design, define, and improve its craft; respect and adopt Vision Launch values; critically reflect on its own performance; and empower itself.

Over time, the production team became oriented toward success in the achievement of its shared vision and goal to innovate by way of its strategy to implement Agile and Scrum methodology within the contexts of design and production. Additionally, its cooperative construction of a cohesive, expressive, and emergent culture system featured dynamic leadership and iterative innovation within the practical contexts of live conversation and online discourse. Through an organic and strategically guided process of emergence, the making of serious videogames unfolded in the innovation of eleven live videogames within one year.

This dissertation has characterized the culture of successful serious videogame production as a cohesive, expressive, and emergent system that thrived on the production team's ability to continually innovate, learn, and adapt within a variety of sociologically, technology, and economically mediated contexts of communication (live conversation and online discourse) and performance (interaction and activity) within and beyond the workplace.

Theory generation

Derived from these findings, a grounded theory was proposed, which emphasized the discovery that in systems of innovation, especially those involving SVG design and production, the core competencies of the system's human workforce are the abilities to innovate, learn, and adapt within a variety of communicative contexts and situations. The identification and relative articulation of these competencies, based on their emergence in practice, has provided an empirically grounded basis on which to build a deep and relevant understanding of the academic needs of the present and future workforce. Sociological, technological, and economic forces promoted and constricted the production team's developmental practice of innovation through

challenge, change, and conditioning, which led to the organization's prolonged, enduring trajectory of collaborative innovation.

Final remarks

Supported by relevant field observations and individual interview data, patterns of activity showed that design (a creative and intuitive process), production (an iterative and transparent process), success (the consistent delivery of high quality games), and sustainability (the prolonged corporate livelihood of the design and production system) were dependent upon dynamic innovation practices that accounted for collaborative interaction among professionally diverse stakeholders; the potential for conflict; the need for critical awareness, tactical negotiation, adaptability, resilience, and effective business acumen; and the vital importance of adhering to a core organizational vision. Vision Launch leaders' strategic broadcast of a concrete and relevant vision, embedded within an Agile Scrum approach to production, led to the structured emergence of an exclusive culture system, shared among members of the Vision Launch innovation team.

Consistently expressed throughout all interviews and in the majority of observed behaviors, activities, tools, and deliverables of the production team, Vision Launch innovation led to the growth and development of a workforce that was increasingly competent in its abilities to innovate, learn, and adapt; committed in its personal investment to the team; and fit to generate sustained SVG design and production. The main implication to be drawn from the grounded theory of innovation practice in systems of SVG design and production is that the core team competencies may provide a starting point for more fully defining the academic needs of humans in the coming decades.

APPENDIX

Interview Guide

Name _____ Position_____ Date_____
Time: _____ Location of the Interview_____

Weeks/Months/Years of Employment with Vision Launch_____ Email Address: _____

Explain: My dissertation study is an ethnographic investigation of interaction and activities involved in producing games for learning. The purpose of this interview is to gain a better understanding of your involvement, perspectives, values and work with Vision Launch and the company.

The analysis of your interview along with a multitude of other data sources will be used to inform and develop a theory about producing games for learning. The goal is to provide designers and researchers with a tool that promotes effectiveness and efficiency in the design of games for learning.

I will never use your real name, nor any other true identifiers related to this project in any publications. I have signed a non-disclosure agreement for work with Vision Launch and am legally bound by its terms. The Vision Launch education director has given me permission from your organization to conduct this interview.

In addition, after this interview has been completed and transcribed, I will email you a copy of the transcript, so that you can make tracked changes to it if there is anything you feel uncomfortable sharing after this interview is complete.

The interview will take about one hour. I will ask general questions and encourage you to elaborate on your answers as you see fit.

Are you willing to complete this interview at this time?

ROLES AND RESPONSIBILITIES

When did you begin working with Vision Launch?

How many hours per week do you spend working for Vision Launch?

Who is your boss?

Describe your role in most Vision Launch projects.

On the days when you have worked for Vision Launch, describe the types of activities you have been involved in thus far, beginning with the day you started working for the company.

Where do you complete these activities? Do you complete any work for this project outside of the workplace?

To what extent do you feel the work that you do for this project is creative? systematic? adaptable to change?

INTERACTION AND COLLABORATION (TEAM WORK)

Who do you interact with most frequently? How do you interact with them? Why do you interact with them?

Who is on your team? How do you envision the role of your team in this project? Are there other teams operating in this project? What are their responsibilities? How and when do you interact with these other teams?

Do you enjoy working with your colleagues? Why or why not? Has this feeling influenced your work or the team's work in any way?

THE PROCESS OF GAME DESIGN

How does game design happen in this project? Are there any specific processes?

Describe the learning curriculum used for the games your team is designing. How was it developed? How is it used today?

PERCEPTION OF PROJECT OBJECTIVES

In your mind, what is the common mission or purpose that unites everyone in this organization? How is this communicated and nurtured?

What do your Vision Launch colleagues do to heighten a sense of understanding, alignment, or attunement among its employees and partners?

When new members enter the organization, what do Vision Launch colleagues do particularly well in educating them about both the mission and values of the organization?

SUCCESSES AND FAILURES

Do you believe your team is successful in achieving its goals? What makes you believe this? What has been the biggest challenge in your work with Vision Launch?

Think of a time when there was an extraordinary display of cooperation between diverse

individuals or groups on the team. What made this cooperation possible? (Explore: planning methods used, communication systems or process, leadership qualities, incentives for cooperation, skills, team development techniques and others).

Give one or more examples of the most effective and the most efficient experiences you have had in achieving project goals.

Do you feel empowered as a result of working with Vision Launch? If so, how?

What is the core factor that gives vitality and life to Vision Launch (without it the organization would cease to exist)?

If you could develop or transform Vision Launch in any way you wished, what three things would you do to heighten its vitality and overall success?

PROJECT INFLUENCE ON TEAM

Has your work with Vision Launch influenced you outside of the workplace? If so, how?

Has your professional experience (in the workplace) and career improved as a result of your work with Vision Launch? If so, how has it? If not, has it diminished or weakened your experience in any way?