
Technological, Content, and Market Convergence in the Games Industry

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Convergence has been touted in recent years as the next big leap in the digital era. Having received considerable attention across a wide range of technologies, markets, and economies, there is comparatively little academic research on convergence in the computer and video games industry. This article investigates this issue by drawing attention to three salient areas of gaming convergence—technological, content, and market. A detailed examination is provided, drawing from a broad selection of literature and practical examples of gaming hardware and software to illustrate the prevalence of convergence in its various forms. The results provide a unique chronological overview of the impact of convergence on the previous and current generations of games and games platforms. The discussion focuses on the new demands placed on the creation of game technology and content, emerging market trends, and the ramifications as a result of the evolving nature of gaming convergence.

Keywords: *games market; computer games; video games; technological convergence; content convergence; market convergence*

Rapid developments in digital technology during recent years have all but changed the face of home entertainment. The proliferation of computers, the Internet, and increasing bandwidth have become powerful in ways far exceeding their raw technical capabilities. Information technology (IT) is now essential not just within a business context but also in the social domain, at home, and with friends as a central hub of communication and entertainment. Similar developments are also taking place across other technologies. TVs are no longer just “televisions”—high definition, liquid crystal displays, plasma, and rear projection are just a few of the recent inclusions in the explosion of the digital era, accelerating the obsolescence of the traditional cathode-ray tube (see “Fear as Glass Firm,” 2005; “Sony Sheds,” 2005), whereas in the United Kingdom and United States, the transition from analogue to digital TV signals will commence in 2008 and 2009, respectively. The same digital phenomenon can also be observed in other devices: video recorders are being replaced by DVD players, digital cameras are taking the place of traditional film, and, although CDs have long since overhauled analogue tape, popularity is shifting toward more compact and efficient iPods and MP3 players. In the midst of these vast

developments, one of the most potent is predicted to be the unification of all related media via a process of convergence.

Convergence is defined in the *Oxford English Dictionary* (2007) as

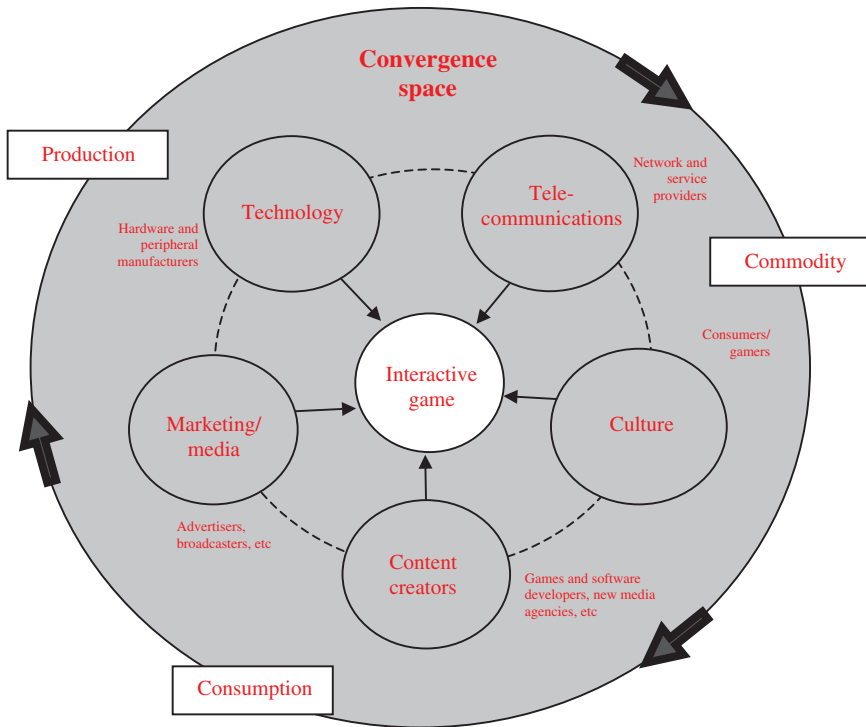
the process by which originally distinct technologies may become more compatible or integrated as they develop, so that an increasing number of devices (especially in electronics, computing, and telecommunications) are multifunctional and interoperable.

As a more generic description, however, digital convergence entails the fusion of any combination of technologies to allow more services and/or products to become available to consumers via a wider range of digital devices (Baldwin, McVoy, & Steinfield, 1996, pp. 3-4; Eastwood, 2006; Rangone & Turconi, 2003). Jenkins (2006) further detailed the fusion of technology, industry, culture, and society with particular attention on their collective penetration into modern consumerism. There are many other examples of literature covering broad aspects of convergence, including

- Technological, business, economic, and regulatory or legal factors (Andersson & Mölleryd, 1997; Bernard & Jones, 1996; Carayannis & Popescu, 2005; Duysters & Hagedoorn, 1995; Freeman & Hagedoorn, 1995);
- The convergence of specific media or industries, such as TV and telecommunications (e.g., interactive and digital TV, e-commerce; see Cowie & Marsden, 1999; Hart, 2004; Rangone & Turconi, 2003);
- The convergence among IT, TV, telecommunications, and publishing, including video downloads and video and publishing on demand (Blackman, 2004; Bores, Saurina, & Torres, 2003; Henten, Samarajiva, & Melody, 2003); and
- The convergence among audio, video, and telecommunications (e.g., third-generation mobiles; “Brits Show Appetite,” 2006; Robins, 2003).

As will be seen later on in this article, although developments in these wide-ranging industries have traditionally exerted a certain degree of influence on the computer and video games industries, recent advances have led toward a much greater fusion of gaming-related content, markets, and technologies. And although the concept of convergence is certainly not new, the complexities associated with it (brought about by the interrelationships among different industries, economies, and technologies) make it difficult to ascertain a precise conceptual framework, especially one that is relevant to the dynamic nature of the games industry, from where this study may be appropriately informed. However, there are some avenues that offer useful starting points. The three circuits model, outlined by Kline, Dyer-Witford, and De Peuter (2003), offers a conceptualization of the potential overlap among technology, culture, and marketing in the context of interactive games. The intersection of processes among these entities takes place within the framework of a “circuit of capital,” which proposes a cyclical nature: production to commodity to consumption. Similarly, a concise summary of the nature of convergence is specified in the

Figure 1
The Circuits of Interactivity and Convergence Space



Source: Adapted from Kline, Dyer-Witford, and De Peuter (2003) and Blackman (2004).

“convergence space,” as described by Blackman (2004), Eastwood (2006), and Pira International (2003), which takes into account the increasing influence played by content creators and telecommunications companies. Within the convergence space, all entities have the potential to collaborate and develop new products and/or services. Taking these factors into account, the illustration given in Figure 1 amalgamates the three circuits model and convergence space to help inform the current investigation on issues of gaming convergence.

Although appropriate, the model remains largely generic and does not fully reflect the specific nature of convergence currently taking place in the games industry. Numerous developments in recent years (to be explored below), fuelled by the rapid pace of change in gaming technology, have led to subtle yet significant changes

in the extent to which convergence exerts influence over the design of new games hardware and software. Thus, the model serves only as a useful starting point and does not, at present, incorporate numerous factors that play key roles during the construction of modern interactive games. The following sections examine three principal areas—technology, content, and market. Each section is supported by a comparison and analysis of gaming hardware (mainly consoles and handhelds) and/or software to illustrate the impact of convergence on various aspects of game design and industry development. The results help to elicit a more thorough understanding of the precise factors taking place in the games industry and how game design has evolved in line with increasing levels of technological, content, and market convergence. Other salient aspects of cultural, economic, and commercial significance (as informed by Figure 1) are also presented within the appropriate sections. Finally, the article concludes with a discussion of the major areas that are likely to take precedence in the industry over the short to medium term.

Forms of Convergence in the Games Industry

As in other industries, convergence in the games market is affected by a myriad of business, regulatory, and economic factors. But because of the generic nature of the term *convergence*, it can often be confusing as to exactly which areas of technology, content, or the market are being investigated. There are, however, issues specific to games. Athreye and Keeble (2000, pp. 228-229) provided a definition describing convergence in the computer industry as consisting of two main types—process or technological convergence and product or content convergence. Technological convergence refers to the fusion of computing and telecommunications technologies; content convergence describes the coming together of the media used, thus, multimedia. In addition, specific market forces also result from a convergence within technologies and content, as already indicated in Figure 1. Special attention is placed on these three areas in the following sections. Other areas of notable interest are also discussed where appropriate.

Technological Convergence

Over recent years, games consoles have gradually incorporated an increasingly diverse range of technologies, including Internet access, DVD, and complementary devices such as hard disks and other PC-related peripherals, most of which are now evident in present-day games platforms (Jordan, 2001; Poole, 2000, p. 11). PCs, on the other hand, are already at a significantly converged state. Yet all games platforms (particularly consoles) have the potential to converge even further with media such as TV broadcasting and the Internet, especially in the area of content on demand for episodic, downloadable games, TV programs, e-commerce, and the like. But in

developing a unified platform, questions remain with regard to price, consumer acceptance, and, most of all, whether technological convergence is detrimental to the fundamental requirements of a games console. During the 1990s, the relative failures of convergent platforms such as the Phillips CD-I and the Panasonic 3DO multimedia systems were attributable in large part to the uncertainty and confusion about their underlying purpose (see Asakura, 2000, pp. 147-148). Even at the time of the initial release of the currently departing generation of consoles (PS2, Xbox, and Gamecube), scepticism of technological convergence was rife. Numerous industry experts felt that inherent factors in consumer attitude, technology, and industry structure would prevent a sudden and complete convergence of technology (Bonnell, quoted in "Convergence," 2000, p. 82; Brimacombe, quoted in "WAP's the Big," 2000, p. 66; Hawkins, 2000). Such examples of failed attempts and cynicism are usefully reflected in the dystopian view of convergence, in which the usability of a converged device is said to be inversely proportional to its functionality (Murphy, Kjeldskov, Howard, Shanks, & Hartnell-Young, 2005). In reality, however, current trends in game hardware design demonstrate a stark contrast. Symptomatic of the pace of change within the games market, the apparent boundaries have now been all but overcome. The rapid pace of technological convergence, especially over recent years, can be illustrated in no better way than observing and comparing the specification and evolution of games consoles since the 1970s. Table 1 details the various technologies and capabilities of popular games consoles over the past three decades, and demonstrates the extent to which convergence is gradually becoming a dominant aspect of hardware design.

Thus, despite previously unsuccessful attempts by platforms such as 3DO and CD-I and concerns of developments toward a unified platform, the facts show that games consoles are evolving into highly versatile machines, mirroring many aspects of the PC (a phenomenon forecasted by Negroponte [1995, pp. 82-83] more than a decade ago, though he also predicted that ultimately consoles will become general-purpose platforms—i.e., PCs). Even before the release of the current generation of Xbox 360 and PlayStation3, Sony was quick to release a converged multimedia machine, the PSX, as a precursor, enabling features such as DVD playback, the recording of TV programs, sharing and writing of music files, storage and viewing of digital photos, and online games, among others (see "Let's Talk About PSX," 2004). These trends clearly underline what Murphy et al. (2005) aptly summarized as the utopian viewpoint of convergence, in which user experience is considered as being proportionately linked to increased functionality. But technological advancement aside, such palpable levels of convergence are not without implications. The unrelenting power and capacity of new platforms in both gaming and peripheral aspects necessitate a massive investment of resources to develop life-like graphics and expansive story lines that gamers have come to expect (an area discussed further below), resulting in spiralling game development costs ("Cost of Making," 2005; Iwata, quoted in "Inside . . . Nintendo," 2001, pp. 65-66; Miyamoto, quoted in "Inside . . . Nintendo," 2001,

Table 1
Comparison of Convergent Technologies on Popular
Games Platforms Since the 1970s

Period	Central Format	Additional Technological Features	Function
1970s			
Atari VCS	Games cartridges	—	Games
Magnavox Odyssey	Games cartridges	—	Games
1980s			
Nintendo NES	Games cartridges	—	Games
Sega Master System	Games cartridges	—	Games
Early 1990s			
Nintendo Gameboy (handheld)	Games cartridges	—	Games
Nintendo Super NES	Games cartridges	Network connection add-on (Japan only)	Games
Sega Game Gear (handheld)	Games cartridges	TV tuner add-on	Games; portable TV
Sega Megadrive	Games cartridges	CD-ROM and backward compatibility add-ons	Games
Mid- to late 1990s			
Nintendo Gameboy Advance (handheld)	Games cartridges	Backward compatibility	Games
Atari Jaguar	Games cartridges	Network add-on for multiconsole connectivity	Games
3DO Company 3DO	CD-based games	CD-ROM	Games; CD player; photo viewer via CD; video CDs with add-on
Philips CD-i	CD-based games	CD-ROM	Games; CD player; photo viewer via CD; video CDs; general multimedia applications
Nintendo N64	Games cartridges	Network or disc drive add-on (Japan only)	Games
Sega Saturn	CD-based games	CD-ROM	Games; CD player
Sony PlayStation	CD-based games	CD-ROM	Games; CD player
Early 2000s			
Microsoft Xbox	DVD-based games	CD-ROM; DVD add-on; hard drive; Internet connectivity	Games; CD player; DVD player; Internet access for online gaming

(continued)

Table 1
Continued

Period	Central Format	Additional Technological Features	Function
Nintendo DS (handheld)	Games cartridges	Wi-Fi network connectivity; backward compatibility	Games
Nintendo Gamecube	Custom CD-based games	Custom CD-ROM; plans for Internet or network connectivity	Games
Sony PlayStation2	CD- or DVD-based games	CD-ROM; DVD; USB; Internet connectivity; backward compatibility	Games; CD player; DVD player; Internet access for online gaming
Sony PSP (handheld)	Custom UMD-based games	Custom movie discs (UMD); USB; wireless network and Internet connectivity	Games; movie player; PC-media player (e.g., MP3); digital photo viewer; Internet access for online gaming
Current generation- 2005 to present			
Microsoft Xbox 360	Dual layer DVD-based games	CD-ROM; DVD; USB; hard-drive; Internet connectivity (including Wi-Fi); backward compatibility; connectivity to PCs and other devices such as digital cameras and iPods; live speech between players via network and headset; HD-TV support	Games; CD and DVD player; PC-media player (e.g., MP3); digital photo viewer; direct transfer of media files from PC; Internet access for online gaming and downloads; streamed music and video
Nintendo Wii	Custom CD- or DVD-based games	CD-ROM; DVD add-on; Internet connectivity (including Wi-Fi); backward compatibility; HD-TV support	Games; Internet access for online gaming and downloads, communities, and browsing; DVD add on; digital photo viewer
Sony PlayStation3	Blu-ray BD-ROM-based games	CD-ROM; DVD; USB; hard-drive; Internet connectivity (including Wi-Fi); backward compatibility; connectivity to devices such as digital cameras and iPods; Bluetooth; HD-TV support	Games; CD, DVD, and Blu-ray player; general media player (e.g., MP3); digital photo viewer; Internet access for online gaming and downloads

p. 65). However, efforts to fulfil the added technical capabilities of new platforms have not necessarily translated into success. Indeed, titles on Xbox 360 and PlayStation3 have been criticized as evidencing only slight improvements over games from the previous generation and have so far failed to stimulate any real excitement among the gaming community (“Making Waves,” 2005, p. 87). These views also corroborate statistical analysis, in which in an extensive survey of all games released in the 4 years between 2000 and 2003 gamer dissatisfaction was seen to derive from that fact that more than 50% of games were of either mediocre or poor quality (Ip & Jacobs, 2006). In comparison, Nintendo has adopted a somewhat different strategy for its latest console, the Wii, by distancing itself from the technological debate (as was also the case with its predecessor, the Gamecube; “Power Struggle,” 2002, p. 68) to focus on delivering an affordable, game-focused, and innovative machine (“Let’s Talk About PSX,” 2004, p. 75; “Making Waves,” 2005, p. 87)—a policy that can be seen to some degree in Table 1, with the Wii featuring much fewer technical features than either Xbox 360 or PlayStation3.

What seems to be certain in the area of technological convergence is that the role of games consoles is set to expand within home environment. With ever-increasing ability to offer alternative forms of entertainment—such as downloadable content, music, video, Internet, and, of course, larger, more realistic games (even on the most technically deprived platforms)—the one-dimensional nature of games consoles and the games appearing on them will gradually diminish. A more detailed discussion of various market forces that may affect this process is provided below.

Content

In contrast to technological convergence, the evolution of game content is taking place through more gradual and seamless avenues. As commented by Fell (1986, p. 234), the striking ability of the film industry to adapt to new conventions and remould audience expectations has been evident throughout its history. It should come as no surprise that the influence of film is also playing a significant role in the development of modern games. As hardware performance increases at each generation, games platforms have the ability to incorporate and warrant extensive full motion video sequences that are heavily influenced by the movie industry (see Poole, 2000, p. 71-78). Indeed, collaborative work between the game and film industries enables the sharing of ideas, technologies, and expertise (Kerr & Flynn, 2003), as was recently the case for the game version of *King Kong* (Ubisoft, 2005), which was closely developed with the film’s director, Peter Jackson (see “Ape Escape,” 2005). Other examples of (seemingly) predestined movie-to-game (or game-to-movie) tie-ins of Hollywood blockbusters include *Lara Croft: Tomb Raider* (Eidos Interactive, 1996), *Lord of the Rings* (EA, 2003), *Spiderman 2* (Activision, 2004b), *Shrek 2* (Activision, 2004a), and *Harry Potter* (EA, 2002), to name but a few. Such is the penetration of convergence between film and games that not only are gamers more aware

of expanding story lines, cinematic cut scenes, and movie-like scripts (Rockstar's [2001] *Grand Theft Auto* and Konami's [1998] *Metal Gear Solid* series are prime examples), but film goers are also more alert to similarities between games and films in terms of computer-generated graphics (Bittanti, 2001; Kane, 2003; Waugh, 2005). The convergence between film and games has also contributed toward the recent establishment of two notable academic disciplines known as ludology (primarily focused on the study of play and game structures) and, in particular, narratology (use and role of stories in games), which help to provide more in-depth analyses and critiques on the use of extensive narrative in interactive games (see Frasca, 1999, 2003; Juul, 2001). In view of the increasing convergence of film and narrative, these specialist subjects facilitate in the development of new theories to help inform game designers as to how narrative might be used more convincingly in interactive environments.

The assimilation of content from other media does not end here. Stimulated by the growing sophistication of gamers' expectations, modern games place great emphasis on the use of music, sound effects, and dialogue (e.g., "Raising Voices," 2006; "Rhythm Faction," 2005; "Score Attack," 2006; "Sonic Boom," 2006; "Word of Mouth," 2000). Areas witnessing notable development are within dancing and rhythm-based genres, with popular titles such as Konami's (2001) *Dance Dance Revolution* and Sony's (1997) *PaRappa the Rapper* utilizing original and licensed music from popular bands. Yet despite claims that audio can constitute as much as one third of the total gaming experience (including the use of actors and famous personalities for voice recordings, professional scriptwriters, and music producers), estimates indicate that audio production can often be neglected as it typically commands only around 6% of the total development budget for a new game ("Raising Voices," 2006b, p. 57).

In addition to graphics, narrative, and sound, arguably the most prominent aspect of content convergence is the fusion of gaming genres. Although visual and audio aspects are purely aesthetic, content—that is, the way the game actually operates with respect to rules, objectives, and its genre (driving, fighting, puzzle, etc.)—is central to the design process. In the advent of more powerful platforms, the convergence of genres has become increasingly apparent, with previously distinct gaming genres becoming difficult, if not impossible, to categorize. Although the literature remains relatively sparse on this subject (even within specialized gaming publications), telling examples can be seen in popular titles such as Rockstar's *Grand Theft Auto* ("Grand Theft Auto: San Andreas," 2004), Sega's *Shenmue* ("Time Extend: Shenmue," 2005), and Valve's *Half-Life 2* ("Half-Life 2," 2004), in which gaming environments combine driving, puzzles, melee combat, strategy, and various other design elements from previous standalone genres. Indeed, given the industry's propensity to develop unoriginal sequels and licensed material, it is proposed that future titles necessitate greater convergence of game types to be innovative ("Building the Perfect Game," 2005). Ultimately, the convergence among graphics, narrative, sound, and genre requires larger development teams, bigger budgets, and greater expertise. Here, the

particular challenge set on content developers is the need for scaleable content and distribution methods that enable games to be transferred seamlessly onto a range of converged platforms (Eastwood, 2006)—an issue to be discussed further below.

To examine the prevalence of the types of content convergence discussed above, an evaluation was made of a selection of games from three distinct game genres (first-person shooter, platform, and driving simulation) released over a period of three decades. The games were carefully chosen to ensure they provide an accurate and chronological reflection of content emanating from their respective genres. Where available, background details on these games were obtained from the appropriate game reviews (e.g., *EDGE*, *Gamespot*, and *Game Rankings*), whereas for older titles (e.g., *Hard Drivin'* and *Operation Wolf*) information was gathered from historical material that accompanied re-released versions acquired for this research. All chosen games were play tested to explore the prominence of various forms of content convergence. The results (shown in Tables 2, 3, and 4 for first-person shooter, platform, and driving simulation genres, respectively) are interesting in that substantial differences can be observed in some instances in which content convergence has made a significant impact on game design. In particular, although little emphasis would be placed on additional types of gameplay in more traditional games, recent titles are demonstrating much greater evidence of convergence in game genres, even within the conventionally typecast first-person shooting and driving genres. Comparisons of core gameplay features between *Hard Drivin'* and *Project Gotham Racing* and between *Operation Wolf* and *Gears of War* illustrate this point quite markedly.

Despite not being based on existing films, the convergence between film and games across the three genres can be observed, quite noticeably, in the increased use of cinematic cut scenes for narrative delivery. In driving games, in which narrative is less prevalent, emphasis is placed on video replays and live races that may be shared and viewed through the game's online community. Similar levels of convergence can also be witnessed in the use of audio, in which apart from technical developments, efforts are expended on the hiring of professional actors, sound recordings of live footage (e.g., of car sounds and orchestras), and licensing of popular bands.

Market

In parallel to technological and content convergence, broad market factors play a key role in shaping the future of the games industry. But unlike the types of convergence described above, market convergence does not appear to be developing with the same degree of fluidity.

In the general area of market convergence, service providers have diversified in industries that may traditionally be considered as ring-fenced. Brought about by increasing market pressures, the need to maintain competitive advantage, and especially the migration from analogue to digital media (Eastwood, 2006, p. 71; Eastwood, 2007, p. 59; Henten et al., 2003; Organisation for Economic Co-Operation

(Text continues on page 214)

Table 2
Comparison of Content Convergence for First-Person Shooters Games Platforms Since the 1970s

Title	Platform	Year of Release and Developer	Principal Genre	Story and Narrative Elements	Music and Sounds	Additional Types of Gameplay or Prevalence of Other Genres
Operation Wolf	Arcade	1987, Taito	First-person shooter	Very basic backstory provided in game. Level completion screens explain game objectives.	Stereo sound. In-game music and sound effects.	None. Player has aim control but character movement is dictated by the game.
Doom	PC	1993, id Software	First-person shooter	Back story (available in game manual). Level completion screens and in-game text explain basic game status.	In-game music (16-bit stereo sound) and sound effects.	Basic puzzle solving (e.g., locating switches, level mazes). Basic platform and adventure-style gameplay required for character control.
Gears of War	Xbox 360	2006, Epic Games	First-person shooter	Extensive backstory; extra story content available on limited edition version. Regular use of cinematic cut scenes before, during, and after levels to explain narrative, game objectives and/or controls. Heavy influence of story on gameplay. Level objectives largely dictated by narrative.	Live orchestra for game music. Use of professional actors for in-game character voices. Dolby digital surround sound.	Puzzle solving and tactical elements: emphasis on cooperative play, strategic positioning of character in levels; strategic use of weapons; level bosses possess unique and elaborate attack characteristics thus requiring planning and problem-solving skills. Driving section: vehicle navigation and use of on-board weapons. Basic platform gameplay required for character control.

Table 3
Comparison of Content Convergence for Platform Games

Title	Platform	Year of Release and Developer	Principal Genre	Story and Narrative Elements	Music and Sounds	Additional Types of Gameplay or Prevalence of Other Genres
Super Mario Bros	NES	1985, Nintendo	Platform	Elementary story. Level completion scenes outline story progression—typically text based.	Stereo sound. In-game music and sound effects.	2D platform. Some evidence of problem solving and exploration required to discover hidden levels or areas. Basic strategy elements required for boss levels.
Mario 64	N64	1996, Nintendo	Platform	Regular use of cinematic cut scenes before and after levels to explain narrative, game objectives, and/or controls. Heavy influence of story on gameplay: numerous level objectives determined by detailed narrative.	In-game music (16-bit stereo, cartridge-based sound) and sound effects.	3D platform. Basic combat or melee system. Numerous levels require problem-solving skills for progression (adventure and puzzle style gameplay). Some levels offer racing- and flying-style gameplay.

(Continued)

Table 3
(Continued)

Title	Platform	Year of Release and Developer	Principal Genre	Story and Narrative Elements	Music and Sounds	Additional Types of Gameplay or Prevalence of Other Genres
Mario Sunshine	Gamecube	2002, Nintendo	Platform	<p>Regular use of cinematic cut scenes before and after levels to explain narrative, game objectives, and/or controls.</p> <p>Heavy influence of story on gameplay: Detailed cinematic sequence is shown before game begins to contextualize player's objectives.</p> <p>Numerous level objectives determined by narrative (e.g., individual levels may change depending on specific missions).</p>	<p>In-game music (16-bit, CD-quality sound and sound effects.</p> <p>Dolby digital surround sound.</p>	<p>Boss levels emphasise strategic gameplay. Extra rewards such as hidden levels only accessible through collecting items by replaying levels.</p> <p>3D platform.</p> <p>Intermediate combat or melee system including shooting weapons.</p> <p>Most levels require problem solving skills for progression (adventure and puzzle style gameplay).</p> <p>Some levels offer racing- and flying-style gameplay.</p> <p>Boss levels emphasise strategic gameplay. Extra rewards such as hidden levels only accessible through collecting items by replaying levels.</p>

Table 4
Comparison of content convergence for driving simulators

Title	Platform	Year of Release and Developer	Principal Genre	Story and Narrative Elements	Music and Sounds	Additional Types of Gameplay or Prevalence of Other Genres
Hard Drivin'	Arcade	1988, Atari	Racing simulation	No story. Introduction and completion screens used to explain game objectives; largely text based.	Stereo sound. Digitized car sounds.	Predominantly racing simulation. Basic information on car status but no requirement to manage or upgrade car or resources.
Gran Turismo	PlayStation	1997, Polyphony, Sony	Racing simulation	No story. Use of cinematic sequences for game introduction and end credits. Video replay features for races.	Digitized car sounds. In-game music. CD-quality stereo sound.	Management elements: collecting, upgrading, and configuration of cars and accessories (role-playing and strategic elements). Driving licence feature emphasizes tactical play.

(Continued)

Table 4
(Continued)

Title	Platform	Year of Release and Developer	Principal Genre	Story and Narrative Elements	Music and Sounds	Additional Types of Gameplay or Prevalence of Other Genres
Project Gotham Racing	Xbox 360	2005, Bizarre Creations	Racing simulation	No story. Ability to watch races broadcasted online. Video replay features for races. Online community.	Extensive use of licensed music (genres include rock, alternative rock, electronica, hip-hop, industrial, classical). Ability to transfer or stream music from other devices to the game. Dolby digital surround sound.	Management elements: collecting and upgrading cars and accessories (role-playing and strategic elements). Kudos system encourages tactical play. Online game community encourages content sharing and competitive, live play.

and Development [OECD], 2004, p. 3), providers have established services such as triple play (Internet, television, and telephone) and quadruple play (Internet, television, telephone, and mobile telephone) to enable customers to purchase multiple channels of telecommunications services via a single package (Eastwood, 2006, pp. 19-20; OECD, 2004, p. 13). It is not surprising, therefore, that extensive policy and regulatory reforms have been documented, with the aim of facilitating the integration of various industries (e.g., OECD, 1999, 2004, 2006, 2007), an issue that will be returned to later in this article. And although market convergence is clearly a very broad subject area, much of which is beyond the context of this study, there are pertinent issues specifically relating to the games industry.

The expansion of online gaming has been the single towering development in recent years, strengthening the links among gaming, the Internet, commerce, and telecommunications. The vast explosion of games such as *World of Warcraft* and *Second Life* has led to the phenomenon of persistent worlds, in which game environments are no longer static canvases but constantly evolve according to the actions of millions of gamers across the globe, hence the term massively multiplayer online games (MMOGs; see Castronova, 2006; Ducheneaut, Yee, Nickell, & Moore, 2006). The significance of these persistent worlds is that not only do they offer truly dynamic experiences, but also gamers are able to engage in the trade of their own unique game achievements. The exchange of game content such as in-game status, characters, game currency, and other game-related resources has transpired into sizeable and complex online economies that go far beyond the traditional boundaries of computer games (Castronova, 2003, 2005). In some cases, transactions between individual players may amount to thousands and millions of dollars as gamers strive to acquire a higher, more respectable status within the game ("Economic Statistics," 2007; "Gamer Buys," 2004).

Although online games such as those above have been traditionally reserved for PCs, they are gradually becoming essential on games consoles. However, with the exception of Microsoft, the development of online services by console manufacturers (viz., Sony and Nintendo) has so far been fraught with difficulty. At present, each of the three companies has adopted a different strategy toward the provision of online gaming (Isensee & Ganem, 2003). Among the leading console manufacturers, the largest investment appears to be that from Microsoft in the form of Xbox Live. The key components to Microsoft's advantage are reported to be the fact that the company has unrivalled access to a wealth of resources from PC- and telecommunications-related industries and vast experience in operating within related markets (see "PlayStation 3 Versus the World," 2006a, p. 53). As yet despite some success (mostly via the DS, Wii, and PSP formats), neither Nintendo nor Sony can claim to be in a comparable position to that of Microsoft with respect to these resources—a direct comparison of Internet- or network-enabled features for the three main consoles is given below. Even with the relative success of Xbox Live, however, the expansive nature of games such as *World of Warcraft* and *Second Life*—and their virtual economies—is yet to be replicated on home consoles.

The oligopoly held by the few manufacturers in the games industry is another salient component, but its connection with convergence may not be immediately apparent. Since the inception of the market in the 1970s, rarely have there been more than two or three dominant players (see, to an extent, the summary of dominant platforms shown in Table 1; see Kline et al., 2003, pp. 171-176). In the current generation, this is likely to remain the case with Microsoft, Sony, and Nintendo. What is more, however, is that the implication of the oligopolistic nature within the games industry is expected to deepen in the advent of digital convergence. Specifically, Kerr and Flynn (2003) describe concerns surrounding the threat posed to smaller, locally based film and game production companies as more power is gathered by major manufacturers and large corporations. In addition to the threat of greater barriers to entry for smaller start-up firms (especially given the convergence of film and games discussed earlier), companies will have less autonomy and creative freedoms and will have to conform to international tastes and distribution methods (Kerr & Flynn, 2003, pp. 108-109).

Despite these threats, market convergence has the potential to create new possibilities for previously unrelated entities. As collaborations between games and telecommunications companies continue to develop, commercial opportunities, particularly via games consoles, can be greatly expanded. It has been predicted that gamers will soon be able to access game-like e-commerce applications that simulate the feeling of being in a real shopping environment, in which users are able to walk around virtual streets and shops and chat with other shoppers before making online transactions (Mamaar, 2003), thus allowing all types of businesses to sell products and/or services through games. The clear potential where future games exist as virtual shopping centers and direct marketing tools represents an exciting commercial opportunity, particularly in view of the ubiquity of Internet shopping, the growing interest in the use of in-game advertising (Allard, quoted in "We Have the Best," 2005, p. 12; "Global Ad Network," 2005; Kline et al., 2003, pp. 225-227, 235-239), and the recent establishment of companies such as IGA Worldwide and Massive Incorporated that specialize in establishing links between potential advertisers and games developers. Such vested interests by commercial entities may also go some way toward subsidizing the rising development costs mentioned earlier. The critical point here is that although other forms of media (e.g., TV broadcasters, commercial Web sites, and mobile devices) are, as yet, incorporating the use of games only as a peripheral feature (if indeed at all) to enhance user experiences, as typified by relatively simple and elementary games (Cummins, 2002; Reimann & Paelke, 2005; Svoen, 2007), companies at the heart of the games market can, via market convergence, embrace aspects such as film, network features, commerce, and broadcasting to enhance titles that already reside at the cutting edge of technology and content design.

To illustrate how the games industry is already embarking on these new opportunities, Table 5 shows a comparison of various community- or network-based features or services currently available on the latest generation of games consoles. Although unable to match the broad network features available on leading PC games, great

developments have nonetheless been made in recent years. Current-generation consoles are able to offer standard features such as game communities, downloads of latest software, and communication services. The only significant distinction, as mentioned earlier, is that Microsoft's Xbox Live appears to have an advantage by being a well-established service in comparison to those offered by Sony and Nintendo, particularly in terms of live, player-to-player online play. The proposed features on Sony's system are similar except for the notable development of Home (Waters, 2007), an interactive community where users can gather and trade unique content similar to that of *Second Life*. In contrast, Nintendo's Wii is geared more toward general software downloads and Internet and information access. At the time of writing, the Wii has relatively limited provisions for online, player-to-player gaming.

Notable from these comparisons is that although the prominence of market convergence is increasing through online communities, a much greater impact can be expected in the very near future. One area in particular lies in the establishment of stronger links between user-generated content and commercial products and/or services. As gaming environments strive toward even greater realism, the communities in which users interact and trade content must also cater for the inevitable rise in expectations. Nintendo's Mii feature currently enables users to create simple but unique avatars, whereas Sony's upcoming Home feature advances this further by allowing more complex character creation for use directly in their respective online communities. In terms of convergence, these communities provide the perfect environment for previously unrelated, third-party retailers and advertisers to develop a presence in the form of advertising, virtual retail stalls, and shopping malls. Here, users of the future will be able to not only browse and interact with products and services (as they would with weapons, items, objects, or characters in traditional video games) but also purchase these items just like they can in real life.

Discussion and Conclusions

The findings presented in this article draw attention to a number of pertinent issues concerning convergence in the games industry. First, a significant evolution of certain aspects of game design has taken place over recent decades, a phenomenon that can be attributed in large part to increasing technological convergence. The comparison of technological features throughout the evolution of games consoles presented in Table 1 demonstrates hardware manufacturers' overwhelming support for the utopian viewpoint of convergence, that user experience is proportionately linked to increased functionality. If there does exist a hybrid stage of technological convergence, in which consumers will reject increased functionality (Murphy et al., 2005), it is yet to be observed in the current generation of technologically diverse platforms.

As a consequence of the heightened possibilities offered by increased hardware functionality, similar levels of convergence can also be witnessed in game content. The

Table 5
Comparison of Features or Services Available on Current Generation Consoles

Platform	Game-Related Features or Services	Additional Features or Services	Potential Future Features or Services
Microsoft Xbox 360	<p>Game community for live player-to-player matches; spectator mode to enable users to watch live matches between other players.</p> <p>Ability to purchase and download additional game content, software updates, and standalone games.</p> <p>Sharing of user-generated game content.</p>	<p>Ability to communicate to and share content with other members.</p> <p>Ability to purchase or download nongame content such as film trailers and music videos.</p>	<p>Ability to purchase more general retail items or items featured in games (e.g., apparel, sports equipment, computer or gaming equipment) directly via user profile and credit system.</p> <p>Ability to access general products and/or services (network providers, banking, local retailers, news and travel information).</p> <p>Live diagnostics for gaming hardware or software problems.</p> <p>Development of more seamless communities (e.g., a game-like interactive environment through which the above services may be accessed).</p>
Nintendo Wii	<p>Constant connection to Internet for immediate game updates.</p> <p>Ability to purchase and download additional game content, software updates, and standalone games.</p> <p>Current provisions for live player-to-player matches are limited on existing titles.</p> <p>Sharing of user-generated game content.</p>	<p>Ability to communicate and share content with other members.</p> <p>News and weather updates.</p> <p>General Internet browsing.</p>	<p>Greater emphasis on live player-to-player matches in forthcoming titles.</p> <p>Ability to purchase more general retail items or items featured in games (e.g., apparel, sports equipment, computer or gaming equipment).</p> <p>Live diagnostics for gaming hardware or software problems.</p> <p>Development of more seamless communities (e.g., a game-like interactive environment through which the above services may be accessed).</p>
Sony PlayStation3	<p>Sharing of content between PlayStation3 and PSP systems.</p> <p>Game community for live player-to-player matches.</p> <p>Ability to purchase and download additional game content, software updates, and standalone games.</p> <p>Sharing of user-generated game content.</p>	<p>Platform may be used as part of the Folding@home medical project.</p> <p>General Internet browsing.</p> <p>Ability to communicate and share content with other members.</p> <p>Ability to purchase or download nongame content (e.g., film trailers and music videos).</p>	<p>Development of more seamless communities (e.g., a game-like interactive environment through which the above services may be accessed).</p> <p>Ability to purchase more general retail items or items featured in games (e.g., apparel, sports equipment, computer or gaming equipment) directly via user profile and credit system.</p> <p>Live diagnostics for gaming hardware or software problems.</p> <p>Sony has announced the release of Home, due in autumn 2007, which is a new online interactive community for PlayStation3 users. Whether or not the above services may be accessed via Home is yet to be confirmed.</p>

most striking observation lies in the coming together of previously unrelated game genres, giving rise to (generally) more complex and expansive games. The examples shown in this analysis underline the massive efforts that are made by modern games developers in combining various gameplay and aesthetic elements into a single interactive experience. However, as opposed to technological convergence, the limitations associated with quantifying content convergence in terms of “better” or more enjoyable games (because of their aesthetic and gameplay qualities) make it extremely difficult to ascertain an accurate measure of effectiveness or consumer acceptance. The main threat posed by increasing levels of content convergence resides in the inevitable rise in resources, coupled by the ever-growing pressure on developers to produce games that fulfil gamers’ expectations. Here, an interesting comparison may be made with technological convergence, as research by Murphy et al. (2005) revealed some evidence to indicate that in times of leisure users prefer specific, standalone devices over general purpose devices. Thus, one major question for future research is whether or not this phenomenon applies in any way to game content, that is, if the fusion of game genres leads to weaker, more diluted games as compared to traditional, genre-specific games. And beyond this, the threat of God’s law proposed by Buxton (2001)—in which in a gaming context content may arrive at a point at which players are overwhelmed by the sheer complexity of a converged game—is a very real possibility. These issues will become increasingly prominent for future work in the field of gaming convergence, for games theorists and designers, toward the search for a better understanding of the balance between converging gameplay on one hand and gamers’ capacity to absorb ever-rising levels of complexity on the other.

New opportunities are also arising in the area of market convergence, the major driving force being the need to expand the user base beyond those confined by traditional market boundaries. The growing prominence of network-based games, again chiefly brought about by technological convergence, will further strengthen collaboration among games developers, content creators, retailers, technology companies, users, and other associated parties. Thus, the future of games development is likely to encompass a broadening of the appeal of video games (the change from traditional, goal- or competition-based games toward more free-roaming, social, and participatory experiences—Jenkins, 2006, p. 243; Newman, 2005; “Online Worlds,” 2005; Twist, 2005), increasing the degree of control afforded to players via user-generated content and expanding the ways in which games may be accessed, particularly with respect to persistent online communities. Hence, as opposed to content that is traditionally dictated by games hardware manufacturers and developers, emphasis will shift gradually toward the user and a greater commercialization of the virtual space.

Be that as it may, market convergence raises several key challenges that are quickly coming to the fore. The greatest barrier at present is that access to persistent game worlds (particularly MMOGs such as World of Warcraft, Second Life, and similar communities) is restricted to the PC. On games consoles, the development of these worlds is largely constrained by hardware differences, incompatibilities, and issues relating to regional lockout between past and present generations of games

consoles. Apart from restricting games to their designated platforms, technical differences often make it impossible (or even illegal) for gamers to play games originating from different market regions (see Ip & Jacobs, 2004), let alone the difficulties associated with persistent worlds. Thus, despite the levels of content, market, and technological convergence shown in the examples presented in this article, console games remain restricted to individual platforms and are only beginning to embrace the broader, networked-based possibilities offered by their PC counterparts. This insular approach in which gamers are confined to specific consoles, combined with the relative simplicity of console-based online worlds, means that greater leaps may be possible only through greater levels of technological standardization among the leading console manufacturers to enable all gamers to access all games and all worlds, regardless of the proprietary platform.

The issue of standardization is one that does not appear to have a clear answer and clearly is a subject that warrants a level of analysis beyond what is possible in this article. However, the traditional argument may again reside in the development of a single, unified platform and the notion that games consoles could become the hub of home entertainment (Allard, quoted in "We Have the Best," 2005, p. 12; Kutaragi, quoted in "Let's Talk," 2004, p. 73; Waters, 2005; Wen, 2007). Despite these forecasts and the clear trend toward technically versatile consoles (as examined in the above section), entertainment devices have by all accounts remained independent—TVs are accompanied by separate video or DVD players and stand-alone CD or sound systems; digital or satellite decoders, despite their similarity to DVD and VCR players, are dependent on service provider (e.g., NTL and SKY in the United Kingdom); and, as seen above, games consoles remain separate from other devices, even with increasing functionality. It is not surprising, therefore, that the paradox in which independent devices persist in spite of technological convergence is referred to as the Black Box Fallacy (Jenkins, 2006, pp. 14-15). Today's PCs, for instance, serve a clear example that although they are capable of providing most if not all of the above features, they remain far from driving other overlapping devices from existence. But increasing pressures arising through the need to enable gamers to gain access to online-based, persistent worlds regardless of hardware and software idiosyncrasies will necessitate a much greater fusion and standardization of technology.

The other potential avenue toward greater standardization may stem from the establishment of international regulatory standards. In the TV, IT, and telecommunications industries, in which digital convergence has reached greater maturity, lessons may be learned to foster debate and collaboration among major stakeholders such that the required regulations and technological standards may be established. However, evidence indicates that previous attempts at promoting partnerships between related markets can be fraught with difficulty in view of the vast differences in agenda between the industries involved (Hart, 2004, pp. 228-232), leading to highly complex and drawn-out affairs when it comes to establishing new regulatory policies (see OECD, 2004). For the games industry, the regulation of diverse (and

potentially inappropriate or sensitive) content, intellectual property rights and ownership of content, creation and control of virtual economies, and technological standardization are just some of the pertinent issues that need to be addressed. Nearly a decade ago, Mueller (1999, p. 13) predicted an open-entry, international market for digital multimedia (including video games) that would make regulation difficult if not impossible to implement. The prediction has, to a large extent, come true for the Internet, but it remains some distance away for the games industry. The issue of standardization, apart from being an inherently time consuming and troublesome process (Cowie & Marsden, 1999; Hogan & Radack, 1997; Morell & Stewart, 1996), is further exacerbated by the rapid pace of change in the games industry, evidenced by a complete overhaul of technology in each new generation of games consoles. The continued fragmented nature of the market means that the balance of power will continue to reside with developers, publishers, and hardware manufacturers. However, added pressure to alleviate the restrictive nature of *de facto* standards in gaming technology can be exerted by telecommunications companies, content and media developers (e.g., advertisers, visual and audio artists, filmmakers, script writers), third-party retailers, and gamers, entities on which game content will be increasingly dependent. And as quite rightly noted by Jenkins (2006, p. 243), general trends to move away from medium-specific content (in this case, games consoles) toward new, converged content via multiple channels will increase the complexity of the relationship between media corporations and their audiences. Thus, the most exciting prospect of market convergence will be the increasing shift of power to consumers, in which user-generated content, differing cultures, and social communities take priority over that which is prescribed by traditional content developers.

There is, however, a broader message that can be gleaned from all of the above analysis. The drivers for convergence can be seen to reside no longer in terms of technology but in the increasing complexity of new content and the ramifications of market convergence. Despite the games industry's previous reservations about technological convergence, it can be seen to permeate the vast majority of modern gaming hardware, enabling users to experience a broad range of media traditionally reserved for other standalone devices. Compellingly, emphasis has shifted toward the convergence of gaming content and devising new avenues through which games can be accessed by anyone, anywhere. These trends increase not only the pressure on developers to create innovative forms of interaction (as already being attempted by the likes of Nintendo's Wii) and gameplay (e.g., the coming together of previously unrelated genres) but also the need for the market to become less fragmented and for new collaborations and standards to be established. It is here, in the area of market convergence, where the greatest difficulty can be expected, as it challenges the very foundation of how the games industry has and continues to operate, with only a small number of dominant companies. This, for the first time in the industry's history, may be set to change in a market in which emphasis is firmly placed on users, user-generated content, and the idea of universal access.

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