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Entertainment Technology in the Pittsburgh Region

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Pittsburgh's role in bringing technological advances to the entertainment industry is legendary. In 1905, the film industry was born in Pittsburgh when the "Nickelodeon" became the world's first real movie theater. This early technology used carbide tanks to produce light and salt water to conduct the electric current, and a bag hung in front of the machine that caught the film after it ran through the projector. Spearheaded by Westinghouse, KDKA became the world's first commercial radio station in 1920, and in 1954, WQED was the nation's first public television station.

Today, Americans spend more than \$150 billion on entertainment, and it's a leading export of the United States. For the most part, Pittsburgh's leading role has been as an exporter of first-rate actors, writers, producers and the newest addition to the entertainment industry, a master's degree in entertainment technology.

In the 21st century, the emergence of computer-mediated digital technologies has created a new realm in entertainment, and ongoing technological advances constantly are changing this industry's multi-faceted landscape. Poised to create and apply this technology is a new generation of workers, and Carnegie Mellon University offers several academic programs and research centers, including the Entertainment Technology Center (ETC), that are at the forefront of training these individuals.

Defining Entertainment Technology

According to the ETC, the term "entertainment technology" refers to:

- on-line networked, massive multi-player and free-standing interactive computer games
- Avatar creation and utilization
- digital entertainment
- specialty venues such theme parks, themed retail, specialty restaurants and other location-based entertainment venues
- motion-based rides
- console and PC interactive game design
- the creation of unique input devices
- virtual reality utilizing head-mounted displays or other technologies, such as CAVES
- wearable computing for entertainment purposes
- massive immersive display environments, such as planetaria and Omnimax theaters
- interactive robot animatronics
- synthetic interview and speech recognition technology
- augmented reality
- telepresence for entertainment and education purposes
- digital production and post-production
- sound synthesis, surround sound, 3-D sound and streaming audio
- the development of haptic devices (i.e. forced feedback)
- entertainment robotics

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In addition, simulation and modeling programs and courses related to digital media contribute to development of talent prepared for jobs in film and entertainment technology. Regional colleges, universities and specialty schools, like the Art Institute of Pittsburgh, are estimated by market research analysts to be turning out more than 1,100 skilled graduates a year.

The entertainment and media industries are the main employers of this new age talent. PricewaterhouseCoopers (PWC) estimates that the size of the global entertainment and media industry will reach \$1.6 trillion by 2013. This sector is white hot; it has long-term appeal, and the Pittsburgh region is positioned to be a key supplier to this large growth sector.

The broader challenge is attempting to define the specific commercial activities associated with this emerging industry cluster, because it is so fragmented and difficult to define. Definitions of this sector vary, but almost all include hardware companies, software developers, media production and specialty technical services, as well as the talent (actors, writers and specialty designers) necessary to support this sector.

This grouping does not include distribution and transmission providers, such as Internet service providers, radio, television or cable broadcasters. In fact, these distributors are key end users of the outputs from the entertainment technology industry, as well as big employers of the specialized talent from the region's education industry.

The region's entertainment technology firms for the most part are component suppliers to larger original equipment manufacturers the likes of Sony, Electronic Arts and other marquee-name brand suppliers of entertainment technology components.

Hardware Manufacturers

Entertainment technology hardware includes but is not limited to:

- household audio and video equipment manufacturers, like Interactive Media Systems, Electronic Design Services and Sima Products
- radio and television communications equipment manufacturers, such as Axcera, The Lerro Corporation and Quintech
- flight simulator manufacturers, such as the Allegheny Flight Simulation Center and Fidelity Flight Simulators
- data conversion media-to-media computer equipment, like that produced by Auora Electrical, Bxvideo Solutions and Digital Design Group

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Software Developers

Entertainment technology software includes:

- game developers, like Schell Games, iKnowThat.com and Impact Games
- learning software, such as that developed by eGenesis, Flipside Media, Quantum Simulations and Etcetera Edutainment
- animation, such as that developed and performed by Paprikaas and Commersel Studios
- product interface design, like that conducted at Daedalus Excel
- publishing, like that developed at PolarSoft
- digital imaging, as performed by Zaxel Systems
- three-dimensional motion capture, like that performed at Cinemanix Productions

Specialty Technical Services

The region is home to 61 video production companies, two film processing companies, five motion picture producers and studios, 15 audiovisual production service centers, 11 theatrical lighting and equipment providers, three motion picture and tape distributors, 15 sound equipment providers and many other small companies in the film and entertainment technology supply chain.

In addition, more than a dozen companies with major stakes in entertainment technology, such as Google, Apple, Intel and IBM, all have opened small R&D offices and technical groups near Carnegie Mellon University. These companies' objectives in Pittsburgh are to be close to hard-to-find talent and to become aware of early new technologies on the horizon.

Talent

Carnegie Mellon's School of Fine Arts has a direct pipeline to Hollywood. The alumni of this school have shaped the television, stage and film worlds, and they have composed for and are performing and conducting in major symphony orchestras, choruses and opera companies. They have built notable buildings and architectural imaging systems; they have created significant innovations in graphic and industrial design; they are professors and deans in major arts institutions, and they have been collected in more than 55 museums worldwide.

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The school's programs in music, drama and art are world-renowned. The cast from the critically acclaimed and popular television series "Hill Street Blues" were mainly alumni of the CMU, including its ground-breaking producer, Steven Bochco., who also produced "L.A. Law" and "NYPD Blue." What is less known, however, is the considerable CMU talent behind the scenes in west coast studios creating and performing special effects.

Integration of Disciplines

The university's Studio for Creative Inquiry is a center for experimental and interdisciplinary learning. Founded in 1989, the studio connects artistic enterprises to academic disciplines across the Carnegie Mellon campus, to the community of Pittsburgh and beyond. The studio's mission is to support creation and exploration, especially within interdisciplinary projects that bring together the arts, sciences, technology and the humanities to impact local and global communities.

Carnegie Mellon University's interdisciplinary approach inspired and enabled Raj Reddy, former dean of CMU's School of Computer Science, to define the field of entertainment technology by acknowledging its roots in the fields of computer science and many of the traditional arts and humanities disciplines.

By combining CMU's College of Fine Arts and School of Computer Science, the ETC has the distinction of offering the first and only two-year masters of entertainment technology (MET) degree. With an eye on the larger challenge of authoring in new media, technologists and fine artists work together on projects that produce new processes, tools and vision for storytelling and entertainment.

In 1995, the combination of artists and techies brought about Informedia, a digital video library project. Informedia researchers Scott Stevens and Michael Christel created a patented technology called synthetic interviews, a speech recognition program used to interview historical and fictional characters.

Attracted by the possibilities of digital media and synthetic interviews in particular, Donald Marinelli left his position as associate head of drama to join the Informedia project. Along with actor Jerry Maher, Marinelli and Stevens created a synthetic interview of Albert Einstein. This remarkably life-like, fully interactive technology received worldwide attention and led to the establishment of Grand Illusion Studios, a Carnegie Mellon spin-off company. It also confirmed Dean Reddy's notion of how new forms of digital entertainment could be created from the collaboration of computer scientists and artists.

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Human Computer Interaction

The staff and students at CMU have been instrumental in making the computer a virtual playground for the masses. In the 1970's, CMU developed an early hypertext system, called ZOG, which was designed for a multi-user environment. ZOG was the first to use the "frame" or "card" model of hypertext, but it was a text-only system. The next generation of ZOG is called KMS, which stands for Knowledge Management System.

CMU's first human computer interaction course was offered in 1993, and an interdisciplinary community of students and faculty, called the Human Computer Interaction Institute (HCII) was founded soon after. By 2000, the CMU faculty and staff directory listed more than 60 faculty, staff and post-doctoral students within the HCII.

Headquartered within the School of Computer Science, the HCII is dedicated to research and education related to computer technology in support of human activity and society. Other Institute members represent the College of Humanities and Social Sciences, Graduate School of Industrial Automation, College of Fine Arts, Carnegie Institute of Technology and the Software Engineering Institute. Collaborators and sponsors come from small start-up companies, multi-national corporations and other universities in Pittsburgh and around the world.

Based on that belief in collaboration, HCII evaluates and monitors new technologies and tools to support human and social activities, which leads to even more knowledge and the creation of even newer technologies. Working with internationally-known researchers in a variety of disciplines, projects range from a small group of students working with an individual company to multi-company consortia pondering multinational solutions.

Heartily endorsed by CMU President Jared Cohon, the Entertainment Technology Center was established in the Fall of 1998. Working from the foundation of an equal partnership between the arts and sciences, the ETC spearheads developments in digital storytelling and new forms of entertainment technology.

The collaboration of drama professor Marinelli and the late, celebrated computer science Professor Randy Pausch has illustrated the educational and professional mission of the ETC. In quick succession, interested students and sponsors showed up for the pilot class of eight CMU seniors in 1999. They graduated in 2001.

Building Virtual Worlds

Carnegie Mellon's Pausch created the legendary Alice rapid prototyping software while he was a professor and researcher at the University of Virginia. When he returned to CMU, he established a

groundbreaking cross-disciplinary course, entitled “Building Virtual Worlds,” which combines the talents of artists and technologists. The course has remained an ETC mainstay.

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Using ETC platforms, camera-based audience interaction techniques and others, the course is designed to engage students with varying talents, backgrounds and perspectives and challenge them to do together what they could not do alone. To display their virtual reality worlds, students use Maya 3-D modeling software, Photoshop painting software and Adobe sound editing software, as well as the ETC's Panda3D engine, originally developed by Walt Disney Imagineering's Virtual Reality studio.

First semester projects are in the context of building virtual worlds. For a frantic two weeks, groups work together with teams, changing with each of the projects. Students undertake five projects during the semester, and the course culminates in a public demonstration to a crowd of more than 500 spectators in a campus-wide forum.

Improvisational acting fosters team building, teaches spontaneity, sharpens focus, increases listening skills, teaches problem-solving, builds from nothing and helps students to recognize and develop basic elements of storytelling, while encouraging them to overcome inhibitions when communicating publicly and working with others. For this reason, the improvisational acting course is a cornerstone of the ETC's curriculum and takes place in the first semester.

Because the emphasis is placed on creation rather than performance, students are able to focus on their application of skills rather than achievement. This results in a creatively stimulating environment.

A course on game design stresses the importance of traditional design, as well as computer game technology. For each of the last three semesters of the program, students can take an elective that is geared towards helping them learn a skill that interests them and will further their employment goals.

Students enrolled at the ETC are practically guaranteed employment from any one of the ETC's many sponsors. They include worldwide companies like Dreamworks SKG, Electronic Arts, Microsoft, Kodak and Intel, as well as national and state employers like the National Aviary, Give Kids the World Village and MTV-U. Local and city-oriented organizations include Philadelphia's Lights of Liberty Show and the New York City Fire Department. Local support comes from the Carnegie Museum, Pittsburgh's Children's Museum and Silvertree Media, to name a few.

Some Current ETC Projects

VisionQuest is a defining example of an educational project currently under development by ETC students working closely with members of The Amblyopia Foundation of America and Childsplay

Vision Systems, LLC. VisionQuest is a video game designed to screen American schoolchildren for vision disorders, such as Amblyopia, or lazy eye, a common cause of blindness and vision loss.

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Skyrates is an innovative game design and development project that explores the idea of creating persistent games for busy people through the use of sporadic play. Rather than devoting hours at a time to playing a game, sporadic play lets users play in five-minute increments throughout the day. Skyrates runs continually, with the Skyrate character flying from place to place. Players check in periodically, like checking email, and give their Skyrate commands. In development for several platforms, including Adobe Flash, AOL Instant Messenger, text messaging for mobile phones and an Online Community Forum, Skyrates strives to create meaningful game play for busy people.

Crayon3D is an easy-to-use platform that enables users to create objects by drawing in the air with their fingers and allowing those drawings, in turn, to appear solid and three-dimensional.

Project Souda brings to mind the sci-fi film thriller “Minority Report” and the ease with which Tom Cruise's character flipped through digital files with no mouse or keyboard. In partnership with global security company Lockheed Martin, the ETC is developing exciting new applications for the Microsoft Surface Table. A 3-D toolkit will allow users to customize gestures for use on the multi-touch surface. For example, with the flick of a wrist, the virtual globe will spin. By integrating Google Maps into a 3-D environment, the Surface Map lets users rotate and tilt maps while simultaneously plotting points and routes. The data visualization interface component will allow users to analyze and manipulate complex logistical scenarios in new and intuitive ways, that are suitably adapted to defense strategies.

The ETC Computer Emergency Response Team (CERT) has teamed with the Software Engineering Institute's CERT to create an interactive training experience that will teach non-technical people how to identify and mitigate threats of computer sabotage from people within their own company. One goal is to create a training experience that will teach trainees to identify warning signs that a co-worker may become an inside saboteur and to mitigate the threat they pose.

ETC Spin-out Companies

While students are likely to find employment with any number of world-renowned companies after receiving their MET from the ETC, others prefer to work for themselves. The following companies are examples of ETC spin-outs.

Located in the south side of Pittsburgh, SilverTree Media is an independent design studio and software developer. In true ETC fashion, SilverTree combines business acumen with technical and artistic expertise. The company's clients range from traditional media corporations, like Disney, to regional educational organizations.

At Schell Games, the focus is on three-dimensional Internet gaming. Launched in 2004 by game industry veteran Jesse Schell, the company's talented group of artists, programmers and game

designers create innovative gaming experiences for a variety of venues, including personal computers, consoles, handhelds, the Internet and theme parks.

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Shanna Tellerman and Jesse Schell co-founded the sixth company to spin out of the ETC, called Sim Ops Studios, which opened in spring of 2006. The company's mission is to turn the editing and sharing of virtual worlds into an everyday experience, by reinventing the future of interactivity on the Web. Sim Ops' initial products are based on CMU's Hazmat: Hotzone technology, and they help prepare firefighters for hazardous materials incidents, and as well as the worst possible scenario terrorist attacks.

Interbots Initiative (IBI) began as a student-pitched project for two semesters in 2004 before it became a company and helped Quasi, IBI's first animatronic character, to become a national star. Selected to be the mascot of the World's Fair for Kids in Orlando, FL, Quasi also has made several television appearances and attended the SIGGRAPH 2005 Emerging Technologies Exhibition in Los Angeles. Interbots's primary goal is to create compelling animatronic characters, both virtual and physical, to interact with the public.

Founded by an Israeli and an American, PeaceMaker is a one-player game in which peace is the ultimate objective. Advisors and content experts in the U.S., Israel and the Palestinian Authority helped design and build this game of the future, in which the player chooses to take the role of either the Israeli prime minister or the Palestinian president. In-game events inspire actions, from diplomatic negotiations to military attacks, and the player interacts with eight other political leaders and social groups in order to establish a stable resolution to the conflict before his or her term in office ends. Located downtown, the company intends PeaceMaker Israel-Palestine to be the first in a series of commercial titles they will produce and publish.

Simply put, Etcetera Edutainment is a software developer for entertainment and educational purposes, but this ETC spin-out focuses on simulations that are visually engaging and provide hands-on experiences. Their approach to gaming at an educational level is called virtual training. Designed for videogamers who prefer to learn by doing and retain more knowledge when they are actively engaged, virtual training combines realistic computer simulations with engaging videogaming technologies. When applied to safety training, the result is fewer mishaps, less litigation and healthier employees. Etcetera's clients include some of the world's largest and most effective companies in manufacturing, healthcare, utilities and transportation. Etcetera Edutainment was founded by 2004 MET grad Jessica Trybus, who won an Entrepreneur of the Year award for the Pennsylvania-Ohio-New York region from Ernst & Young in 2009.

Electric Owl Studios is creating a child-friendly world in which the latest digital technology meets fine art in an attempt to push the boundaries of traditional children's entertainment. With the belief that every child has a natural creative instinct, the company's work focuses on building intuitive, unique applications for kids that inspire creativity and exploration, in the vein of another Pittsburgh entertainment icon, Fred Rogers.

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Semiotic Technologies provides a safe, adaptable, virtual environment for individualized education and training. The company uses the power of interactive game technology to increase decision-making skills significantly and to magnify content retention in the light of real-world scenarios and pressure.

CMU and Google

With an office located in Pittsburgh, Google and CMU researchers have collaborated on several initiatives, including ESP: an online, multi-party game that harnesses human cognitive capabilities to index images on the Web. As people play the game, they identify and accurately label images, which enable more efficient searches, improve the accuracy of assisted reading devices for the visually impaired and help Internet users block inappropriate images. Google has licensed the game, which the company calls Google Image Labeler.

CMU also helped Google to create Global Connection, a software system that can overlay images onto the company's Earth imaging browser. With the software, people around the world can be taught to appreciate the oneness of the planet with a critical first-person perspective to storytelling and cross-cultural learning, which in turn serve to bridge gaps in physical and cultural distance.

Motion Pictures and Television

In an effort to appear film-friendly, Pennsylvania has given sales tax exemptions of up to 25 percent to feature film productions in the past, but in July 2006, the commonwealth got even friendlier and began offering filmmakers 20 percent film production grants instead of tax credits. Up to \$10 million are awarded annually. Another plus for Pennsylvania is that producers are permitted to shoot on state-owned property.

Screenwriter and television writer/producer Carl Kurlander ("St. Elmo's Fire" and "Saved by the Bell") believes in Pittsburgh's ability to reclaim its birthright and become an outpost for the entertainment industry. As a visiting professor in the English department at the University of Pittsburgh, Kurlander is the founder of Pitt in Hollywood and co-founder of the Steeltown Entertainment Project.

Pitt in Hollywood is a list of people with Pittsburgh roots who have ties to the entertainment industry. The organization's goal is to encourage interaction between the entertainment industry and the university community.

Co-founded with Ellen Weiss Kander, The Steeltown Entertainment Project is a non-profit organization whose mission is to utilize southwestern Pennsylvania's rich local resources and the

loyal entertainment expatriates to help create meaningful, commercially promising, regionally produced film, television and new media.

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Steeltown Entertainment has been working with a variety of financial and in-kind supporters, including the LA-based family entertainment production company, The Hatchery LLC, to bring film work to the Pittsburgh area. Their most recent success was in securing \$975,000 to produce "Don't Think About It," a direct-to-DVD movie starring Emily Osment from Disney Channel's "Hannah Montana." The largest contributors to the project were Colcom Foundation (\$200,000) and the state Department of Community and Economic Development (\$300,000).

In their efforts to facilitate filming in the Pittsburgh area, the Pittsburgh Film Office (PFO) promotes the southwestern Pennsylvania region as a great location for movie, television and commercial productions. The PFO provides information on the region, locations, vendors and crew, and it coordinates government and business offices in support of a production. It also serves as a conduit in providing assistance to local filmmakers and the local film industry.

Since the early 1900s, 123 motion picture and television productions have been made in the southwestern Pennsylvania region. Of that number the PFO has attracted 90 of them resulting in an economic impact of more than \$360 million. Some major production titles shot in Pittsburgh include:

The Perils of Pauline	Houseguest
The Dear Hunter	Sudden Death
The Silence of the Lambs	Striking Distance
The Mysteries of Pittsburgh	Dawn of the Dead
Flashdance	The Fish That Saved Pittsburgh
Wonder Boys	Gung Ho
Dogma	Mrs. Soffel
Inspector Gadget	Lorenzo's Oil
Hoffa	Milk Money
Night of the Living Dead	Bob Roberts
Slap Shot	Passed Away
The Clearing	Dominick and Eugene
Mothman Prophecies	Angels in the Outfield
Kingpin	
Boys on the Side	

In 2008, the Pittsburgh region hosted 11 productions that generated \$50 million in economic benefits, including jobs for theatrical carpenters, electricians and specialists in wardrobe and sound production. These businesses primarily assist production companies from outside regions.

However, there are a handful of motion picture producers and studios in the Pittsburgh area, including Argentine Productions, which creates IMAX[®] films, broadcast documentaries, museum

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films, educational videos and other media services for a wide variety of national, regional and local production partners. Award-winning producer, director and writer Peter Argentine founded the company in 1994. One of Argentine's most recent productions was "Where History Lives: A Tour of the White House."

The Magic Lantern began as a consulting and production company in 1973. Under the leadership of founder and creative director Bob Rutkowski, The Magic Lantern has since produced countless films, videos, television specials and interactive programs for business, industry, government, museums and non-profit organizations.

Located in downtown, Big Science composes and records music and sound effects for film, video, television, radio commercials, video games and the Internet. Launched in 1996, Big Science has won numerous awards in international competitions for original music and sound design, including at the One Show and at Cannes.

Cinemanix Productions is an advanced motion capture and visual effects production studio based in Pittsburgh. Using the latest in motion capture, optical tracking systems, high-definition green screen video production, advanced three-dimensional animation and visual effects, the company has provided visual production services for local, regional and national clients, including Nickelodeon. The type of technology and services that Cinemanix provides are unavailable between San Antonio and Boston. The company recently signed a deal with the producers of the Mac Break HD video podcast to shoot all of its episodes on the sound stage at Cinemanix.

Pittsburgh's emerging entertainment technology industry owes an inordinate debt of gratitude to Carnegie Mellon University. However the Pittsburgh region's entertainment technology roots began as far back as the turn of the 20th century, when Harry, Sam, Abe and Jack Warner had their interests piqued enough by the success of the Nickelodeon to form the Pittsburgh-based Duquesne Amusement Supply Company. Pittsburgh's Warner Theater was by all accounts the second theater in the Warner Brothers' stable, and ultimately their new business led them to form a major Hollywood studio.

Certainly much has transpired in this industry since the early 1900s, but looking forward it may be prophetic for Pittsburgh when Bob Evans, editor-in-chief for *InformationWeek* magazine, asserted that computer science, when coupled with fine arts, will make a better state.

Visit: www.etc.cmu.edu/

www.quintechelectronics.com/about.php

www.schellgames.com

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Backgrounders in this series featuring technology centers of excellence in the Pittsburgh region include:

Cybersecurity
Data Storage
Electro-Optics
Energy Technology
Entertainment Technology
Micro-electromechanical Systems

Nanotechnology
Robotics
Specialty Metals
Supercomputing
System-on-a-Chip
Tissue Engineering