

Video Games in the 21st Century

ECONOMIC CONTRIBUTIONS OF THE US
ENTERTAINMENT SOFTWARE INDUSTRY

By Stephen E. Siwek



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In 2005, Mr. Siwek authored an influential study entitled Engines of Growth: Economic Contributions of the US Intellectual Property Industries (Commissioned by NBC Universal, 2005). More recently, Mr. Siwek authored three widely reported studies that measured the overall cost of motion picture, sound recording and copyright piracy to the U.S. economy as a whole. The True Cost of Motion Picture Piracy to the US Economy (Policy Report 186) was published by the Institute for Policy Innovation (IPI) in September 2006. In 2007, IPI published The True Cost of Sound Recording Piracy to the U.S. Economy (Policy Report 188) and The True Cost of Copyright Piracy to the U.S. Economy (Policy Report 189). In the Copyright Piracy report, Mr. Siwek estimated the combined costs of motion picture, sound recording, business software and entertainment software piracy to the economy as a whole.

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EXECUTIVE SUMMARY

Video Games in the 21st Century: Economic Contributions of the US Entertainment Software Industry is the first study that quantifies in detail the specific contributions of the US entertainment software industry to the US economy. The report concludes that:

- The US entertainment software industry directly employs more than 24,000 people in 31 states.
- In 2006, these employees received total compensation of \$2.2 billion.
- The total US employment, both direct and indirect, that depends on entertainment software now exceeds 80,000.
- For the four-year period 2002 through 2006, direct employment in the US entertainment software publishing industry grew at an annual rate of 4.4%.
- In 2006, average compensation per employee (wages, salaries and employer contributions for pensions, insurance and government social insurance) was \$92,368.
- The US entertainment software industry's value added to US Gross Domestic Product (GDP) was \$3.8 billion.
- The real annual growth rate of the US entertainment software industry exceeded 17.0% in the periods 2003-04 and 2005-06. During the same years, real growth for the US economy as a whole was below 4.0%.
- The entertainment software industry makes a disproportionate contribution to real growth for the US as whole. In the periods, 2003-04 and 2005-06, the industry's contribution to real growth exceeded its share of GDP by more than four to one.

I. INTRODUCTION

The US industry that develops and publishes computer and video games creates forms of entertainment that have never previously existed. This industry generates sales in the billions of dollars and creates thousands of American jobs. The US entertainment software industry is also one of the most rapidly growing industries in the United States.¹ In 2006, the industry's contribution to growth in the overall US economy dramatically exceeded its share of the US economy as measured by value-added to GDP. Unlike many other industries, the US entertainment software industry disproportionately adds to real growth in the US economy.

This report, *Video Games in the 21st Century: Economic Contributions of the US Entertainment Software Industries*, presents a number of statistical measures that quantify the economic contributions of the entertainment software industry in the early years of the 21st Century. The statistical measures included in this report were either taken directly from US government sources such as the US Census Bureau or were derived using public data from those sources. A basic problem in using US government data to assess the entertainment software industry is that most (but not all) of the most relevant statistics apply to broader industry groupings such as software publishing. For this reason, a number of the estimates in this report were first derived using statistical data that applied to a broader industry grouping

than entertainment software. Subsequently, where possible, these broader measurements were adjusted to better reflect the known characteristics of the entertainment software industry.

In addition to government sources, certain information on the number of US game developer and game publisher establishments by state was obtained from a non-government source entitled <http://gamedevmap.com>. This source, created by Gaurav Mathur, reports publishers, developers, organizations, mobile/handheld developers and online developer locations or establishments throughout the world. In this report, the developer locations in the United States were combined with other data sources to estimate the current level of "direct" employment in the entertainment software industry on a state-by-state basis.

Finally, this report also made use of company-specific responses provided by Entertainment Software Association (ESA) member firms to a brief set of survey questions developed by Economists Incorporated. The survey questions focused on each member company's employment and compensation levels by year and by location. Since the actual responses to these survey questions were confidential, they could not be simply reproduced in this report. Nevertheless, these responses were used in a number of instances to check the basic reasonableness of government data sources.

¹ In this report, establishments and firms that develop and/or publish entertainment software for use with a personal computer or with a console, mobile device or "online" will be described as belonging to the entertainment software industry.

II. THE US ENTERTAINMENT SOFTWARE INDUSTRY

In 2005, US retail sales of computer and video games exceeded \$7.0 billion.² US consumers play video games on game players (usually called consoles) such as the Sony PlayStation 3, the Microsoft Xbox 360 and Nintendo Wii. Video games are also played on personal computers (PCs) and on mobile video players such as the PlayStation Portable “PSP,” the Game Boy Advance and the Nintendo DS. Finally, video games are played “online” over the Internet and other proprietary online networks. Software game developers frequently design games to be played on many of these “platforms.”

According to industry statistics, US sales of computer and video games grew from \$2.6 billion

in 1996 to well over \$7.0 billion today.³ In the same period, unit sales of video games rose from 74.1 million in 1996 to more than 250 million in 2006.

While the growth of the industry can be clearly seen in industry source data, most government statistical references in the United States do not report software game publishing as a separate US industry. In US statistics, software game publishing is typically included within the broader industry category of software publishing. In the North American Industry Classification System (NAICS), the software publishing industry (NAICS 511210) “comprises establishments primarily engaged in computer software publishing or publishing and reproduction. Establishments in this industry

Table A-1: US Entertainment Software Industry (2002)

	ESTABLISHMENTS	RECEIPTS (000)
Entertainment Software Industry Product Line #35652	432	\$3,903,938
Total Application Software Publishing Product Line #35650	7,080	\$46,747,671
Total Software Publishing NAICS 511210	9,953	\$103,505,848

Source: US Census Bureau, 2002 Economic Census, Information Survey, Table 1, Product Line by Kind of Business for The United States: 2002.

² Entertainment Software Association, 2006 Essential Facts about the Computer and Video Game Industry, page 10.

³ Id. Page 11.

carry out operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation, and providing support services to software publishers. These establishments may design, develop, and publish, or publish only.”⁴

While US government sources generally do not report separate statistics for the US entertainment software industry, there is at least one exception to that rule. As part of its last detailed census for the year 2002, the US Census Bureau provided “Product Line” information for individual products and services within the broader category of software publishing. The product line information included the number of establishments with the product line, the total receipts of the establishment and the product line receipts of the establishment for 2002. In Table A-1, we report product line data for game software

publishing, total application software publishing and total software publishing.

As shown in Table A-1, in 2002, the entertainment software industry had 432 “establishments” in the United States. Establishments are defined as “a business or industrial unit at a single physical location that produces or distributes goods or performs services. An example would be a single store or factory.”⁵ By contrast, in 2002, there were 7,080 US establishments publishing application software and 9,953 establishments in the US software publishing industry as a whole.

The annual receipts of the entertainment software industry (in thousands of dollars) are also reported in Table A-1. As shown in the table, the entertainment software industry reported total receipts of \$3.9 billion in 2002.

⁴ US Office of Management and Budget, *North American Industry Classification System*, United States, 2002, 511210 – Software Publishing, page 657.

⁵ US Census Bureau, *Understanding the 2002 Economic Census*, page 2.

III. TRENDS IN SOFTWARE PUBLISHING AS A WHOLE

While the product line information shown in Table A-1 provides a critical starting point for assessing the economic importance of the US entertainment software publishing industry, the product line data alone do not provide a sufficient basis for estimating the industry's contributions in more recent years. In this analysis, updated estimates of entertainment software publishing employment and value added are developed by combining government and

industry source references. US Census data for the broader software publishing industry represent one of the more important of these sources.

Table B-1 provides information on trends in the US software publishing industry for the years 2002-2004. In this period, (the end of the technology and telecom boom) both employment and establishments in the software publishing industry declined significantly. However, the number

Table B-1 US Software Publishing Industry 2002-2004

	2002	2004	PERCENT CHANGE
Number of Employees	356,708	328,623	-7.87%
Number of Establishments	9,953	9,085	-8.72%
Employees Per Establishment	35.84	36.17	0.93%
Payroll (\$000)	\$34,934,949	\$34,866,418	-0.20%
Payroll / Employee	\$97,937	\$106,099	8.33%
Receipts	\$103,505,848	\$112,262,000	8.46%

Table B-2: US Software Publishing Industry 2004

		TOTAL SOFTWARE INDUSTRY	FIRMS WITH MORE THAN 1,000 EMPLOYEES	FIRMS WITH MORE THAN 1,500 EMPLOYEES
Paid Employees	#	328,623	180,227	164,424
	%	100.0%	54.8%	50.0%
Number of Establishments	#	9,085	1,647	1,485
	%	100.0%	18.1%	16.3%
Employees Per Establishment			109.43	110.72

of software employees per establishment remained relatively constant. In the same time frame, the total software publishing payroll remained flat while payroll per employee increased by more than 8.0% as did total receipts. The data suggest that, after 2002, the software industry shed employees and establishments even as sales levels continued to increase. With fewer employees available to do the work, the software employees who remained in the industry achieved payroll increases matching the industry's sales growth.

In Table B-2, the software publishing employment data from Table B-1 is disaggregated to show the subset of industry workers who are employed at firms with more than 1,000 or 1,500 employees.

The data show that for these sub-categories, the average number of employees per establishment in firms of more than 1,000 employees was 109.43 while, for firms of more than 1,500 employees, the average number of employees per establishment was 110.72.

Software publishing employment at firms of less than 1,000 and 1,500 employees is reported in Tables B-3A and B-3B. As shown in Table B-3A, the total number of software employees at firms with less than 1,000 employees was 148,396 or 45.2% of the total. For firms with fewer than 1,500 employees, the comparable figures were 164,199 employees and 50.0% of the total. If one were to remove employees in firms of 0-4 employees, the

Table B-3A: US Software Publishing Industry 2004

	TOTAL SOFTWARE INDUSTRY	FIRMS WITH LESS THAN 1,000 EMPLOYEES	FIRMS WITH LESS THAN 1,500 EMPLOYEES
Paid Employees	328,623	148,396	164,199
	100.0%	45.2%	50.0%
Less: Employees in Firms with 0-4 Employees	-4,981	-4,981	-4,981
Adjusted Employees	323,642	143,415	159,218

Table B-3B: US Software Publishing Industry 2004

	TOTAL SOFTWARE INDUSTRY	FIRMS WITH LESS THAN 1,000 EMPLOYEES	FIRMS WITH LESS THAN 1,500 EMPLOYEES
Number of Establishments	9,085	7,438	7,600
	100.0%	81.9%	83.7%
Less: No Employee Establishment	-644	-644	-644
Less: Employees in Firms with 1 to 4 Employees	-2,346	-2,346	-2,346
Adjusted Establishments	6,095	4,448	4,610
Net Employees Per Establishment		32.24	34.54

totals fall to 143,415 for firms with less than 1,000 employees and 159,218 for firms with less than 1,500 employees.

In Table B-3B, we adjust the reported establishment data for the industry so that we can estimate establishments at firms with less than 1,000 and 1,500 employees. As shown in Table B-3B, in 2004, there were 7,438 establishments (81.9%) at firms with less than 1,000 employees and 7,600 establishments (83.7%) at firms with less than 1,500 employees. If these figures are adjusted to eliminate establishments with no employees (sole practitioners) and establishments with 0-4 employees, the totals fall to 4,448 establishments at firms with less than 1,000 employees and 4,610 establishments at firms with less than 1,500 employees.

The average number of employees per establishment employed at firms with less than 1,000 and 1,500 employees is also reported in Table B-3B. The figures are 32.24 employees per establishment for firms with less than 1,000 employees and 34.54 employees per establishment for firms with less than 1,500 employees.

The information presented in this section of the report will be used in analysis of the entertainment software industry described subsequently. These tables above show that in the US software industry, the average number of employees per establishment remains quite stable even as

total software employment declines. As shown in Table B-1, the average number of employees per establishment for all software firms was 35.8 employees in 2002 and 36.2 employees in 2004. These averages changed only slightly even as the software industries' total employment fell by 28,000 workers or nearly 8.0%.

The tables also demonstrate that the average number of employees per establishment is not constant as the size of the overall firm increases. For larger firms (with more than 1,000 employees), the average number of employees per establishment was 109.43 (See Table B-2). For smaller firms (with fewer than 1,000 employees) the average number of employees per establishment was 32.24 (See Table B-3B).

In this analysis, it is assumed that the averages for software employees per establishment described above can be used to estimate entertainment software employees per establishment as well. In other words, the average number of employees per establishment in the entertainment software development *subset* of the broader industry is not appreciably different from what is observed in the rest of the software publishing industry. With this assumption in hand, we can then derive entertainment software employment based on the number of entertainment software establishments (or locations) that now exist in the United States. For this purpose, non-government game developer data that is published by gamedevmap.com, is relied upon.

IV. US EMPLOYMENT IN THE ENTERTAINMENT SOFTWARE INDUSTRY

Employees in the US entertainment software industry may work in small game developer shops or in large game publishing companies with thousands of employees. They may be employed as programmers, arts and animation specialists, game designers, game production experts, quality assurance personnel, audio specialists, legal staff members, and business or marketing personnel. Developers may specialize in games for specific types of platforms including mobile, handheld and online media.

In the entertainment software industry, websites are available that list the names and locations of publisher and developer establishments both in the United States and abroad. One of these websites, <http://gamedevmap.com> provides publisher and developer locations by city and state. Locations are also provided for publisher/developers specializing in

mobile, handheld or online games. In this study, the US-based publisher and developer locations listed in gamedevmap.com were used to estimate the number of entertainment software establishments by type of establishment and the number of workers now employed in the industry by state and for the US as a whole.

The data in gamedevmap.com provide separate listings for game publisher and game publisher/developer locations. As show in Table C-1, in the United States there are at least 41 game publisher locations and 50 publisher/developer locations for a total of 91 locations or establishments, located in 19 states.

The data in gamedevmap.com included listings for game developer locations by type of developer. As reported in Table C-2, there were 325 non-specialized developer locations, 42 mobile and handheld developer

Table C-1: US Publisher and Developer / Publisher Counts by State

NUMBER OF STATES	NUMBER OF PUBLISHER LOCATIONS	NUMBER OF DEVELOPER/ PUBLISHER LOCATIONS	TOTAL DEVELOPER + PUBLISHER LOCATIONS
19	41	50	91

Source: <http://gamedevmap.com>, pulled May 16, 2007.

Table C-2: US Developer, Mobile /Handheld and Online Developer Counts by State

NUMBER OF STATES	NUMBER OF DEVELOPER LOCATIONS	NUMBER OF MOBILE/ HANDHELD LOCATIONS	NUMBER OF ONLINE DEVELOPER LOCATIONS	TOTAL DEVELOPER LOCATIONS
31	325	42	56	423

Source: <http://gamedevmap.com>, pulled May 16, 2007.

locations and 56 online developer locations for a total of 423 locations or establishments in 31 separate states.

One of the principal reasons for tabulating the publisher and developer counts by location in Table C-1 and Table C-2 was to estimate total game industry employment by state and for the US as a whole. Recall that in Table B-2 and Table B-3B, the number of employees per establishment for large and small firms in the software publishing industry as a whole was calculated. For software firms with less than 1,000 employees, the average number of employees per establishment was 32.24, and for software publishing firms with more than 1,000 employees, the average number of employees per establishment was 109.43.

In this analysis, it is assumed that the average number of employees per establishment in the game software publishing subset of the software publishing industry is not appreciably different from what is observed in the rest of the software publishing industry. Also, in the entertainment software publishing industry, game publisher firms typically employ at least 1,000 US workers in total while game developer firms would generally employ fewer than 1,000 US employees⁶

When the game publisher and developer location data are combined with the employment data for the software publishing industry, it is possible to derive estimates of entertainment software publisher and developer employment by location. The US total employment figures are shown in Table C-3.

Table C-3: US Entertainment Software Industry Direct Employment By State

NUMBER OF STATES	EMPLOYEES IN PUBLISHER GROUP	EMPLOYEES IN DEVELOPER GROUP	TOTAL DIRECT EMPLOYEES
31	9,958	13,638	23,596

Note: Publisher Group includes Publishers, and Developer & Publishers; Developer Group includes Developers, Online Developers, and Mobile / Handhelds. Employee data is calculated using Net Employees per Establishment with less than 1,000 employees for Developer Group (32.24) and Net Employees per Establishment with more than 1,000 employees for Publishing Group (109.43). See tables B-2, B-3B.

Source: <http://gamedevmap.com>, pulled May 16, 2007.

Table C-4: Comparison of Direct Employee Shares per State Top Six States

State	EMPLOYEES PER STATE TABLE C-3		RESPONDENTS BY STATE GAME DEVELOPERS SALARY REPORT
	Number	Percent	Percent
California	9,245	39.18%	41.84%
Washington	2,674	11.33%	10.24%
Texas	2,172	9.20%	7.07%
New York	1,501	6.36%	4.19%
Massachusetts	1,012	4.29%	5.31%
Illinois	896	3.80%	4.96%
Subtotal	17,500	74.16%	73.61%
Total All States	23,596		

Source: The Game Developer Salary Report 2004-2007.

⁶ The assumption that game software publisher firms generally employ at least 1,000 people has been selectively confirmed by ESA member companies in their survey responses.

Table C-5: Total Direct Employment At US Entertainment Software Publisher / Developer Establishments 2006

I.	Entertainment Software Publisher / Developer Employees At Establishments with 5 or More Employees*	23,596
II.	Entertainment Software Publishers Employees At Establishments with Less than 5 Employees Divided by Software Employees At Establishments with 5 or More Employees**	5,626 / 322,998
		=1.74%
III.	Apply to Entertainment Software Publisher / Developer Employees	=411
IV.	Total Entertainment Software Publisher / Developer Employees at All Establishments Row I Plus Row II	=24,007

* Table C-4

** 4,981 plus 644 = 5,626. 328,623 less 5,626 equals 322,998. See Table B-3A and B-3B

As reported in Table C-3, there are now at least 23,596 workers directly employed at entertainment software publisher and developer locations in the United States. Of this total, 9,958 workers are directly employed at game publishing companies while 13,638 people now work directly for US-located game developer firms.

Because of how it was estimated, the employee data shown in Table C-3 can be disaggregated on a state-by-state basis. The total number of workers directly employed at entertainment software publisher and developer firms in the industries' top six states are shown in Table C-4. California, Washington, Texas, New York, Massachusetts and Illinois collectively employ 17,500 workers or 74% of the total direct employment for the US entertainment software industry as a whole.

In Table C-4, we also report the number of respondents by state to the most recent game developer salary survey conducted by Game Developer Research of San Francisco.⁷ These data on game developer respondents by state closely match the employment data by state calculated above. In the respondent data, the top six states comprise 73.61% of all survey respondents. In the employment data, the top six states account for 74.16% of all employees. In the respondent data, 41.84% of the respondents were located in

California. In the employment data, 39.18% of the industry employees were located in California. This comparison, while approximate at best, nonetheless adds confidence that the basic approach to estimating entertainment software employment in this analysis is sound.

In Table C-5, the employee total for all states that was previously reported in Table C-3 is adjusted upward by 1.74%. This adjustment is needed because the publisher and developer locations used in the state-by-state analysis did not extend to establishments with fewer than five employees. In Table C-5, data from the software publishing industry as a whole is used to estimate the number of entertainment software workers employed in small establishments with five or fewer employees. On the basis of this calculation, the total direct US employment for the entertainment software industry rises from 23,596 to 24,007 workers.

Any estimate of the number of workers directly employed in a given industry will not capture the full impact of that industry on the economy as a whole. The US economy functions as an interlocking system where changes in supply and demand for one industry affect supply and demand in others.

The US entertainment software industry creates products that combine the skills of the industry's

⁷ Game Developer Research, *Game Developer Salary Report 2004-2007*, page 42.

**Table C-6: US Entertainment Software Industry
Direct & Indirect Employment By State**

NUMBER OF STATES	TOTAL DIRECT EMPLOYMENT	TOTAL DIRECT + INDIRECT EMPLOYMENT*
31	23,596	80,963

* Reflects a weighted average direct effects multiplier of 3.4312.

** US BEA, RIMS II, Direct Effect Multipliers by State, Industry 511200, Software Publishers, Table 1-A.

employees with other inputs of goods and services that are purchased from other industries. For example, a game developer may need to acquire a specific type of graphic design software from another firm in order to produce the game under development. Revenue from that purchase can be used to compensate employees at the firm that makes the graphic design software product. There would also be similar linkages to suppliers of the graphic design software firm and further linkages to those suppliers and on through the economy.

The US government developed a widely accepted mathematical model, known as the Regional Input-Output Modeling System (RIMS II) that uses input-

output relationships throughout the economy to capture these interlocking affects. The input-output relationships are industry specific and take the form of “multipliers.” In this analysis, employment multipliers for the software publishing industry were obtained from the US Bureau of Economic Analysis (BEA) for all states where entertainment software employment was located. These multipliers were applied to the direct game industry employee counts on a state-by-state basis. The weighted average multiplier across all states was 3.4312. As shown in Table C-6, these calculations suggest that, in 2006, the total direct and indirect employment for the US entertainment software industry as a whole was 80,963 people.

V. EMPLOYMENT GROWTH SINCE 2002

As noted earlier in this report, US government sources do not generally report separate statistics for the US entertainment software industry. For this reason, there are no government reports that track the industry's annual growth over time. However, given the statistics that are available, the entertainment software industry's growth since 2002 is undeniable.

In Table D-1, the entertainment software industry "product line" data from the 2002 US Census is compared to the 2006 employment data that was estimated in the previous section of this report. As shown in Table D-1, the Census found that there were 432 entertainment software publishing establishments in operation in 2002. To this value, the average ratio of employees per establishment

for entertainment software publishing that was developed in Tables C-1, C-2 and C-5 was applied. This ratio was 46.71 employees per establishment.⁸ By this calculation, a 2002 estimate of direct employment in the entertainment software publishing industry of 20,177 was derived.

With estimates of industry employment in 2002 and 2006, it can then be solved for the compound annual growth rate that is implied by these two values. As shown in Table D-2, that growth rate is 4.44% per year.

In order to put this growth rate into perspective, it can be compared to the employment growth achieved by the broader US entertainment software industry for the same time period. According to the US Bureau of Labor Statistics, total employment in all of software

Table D-1: Estimate of Growth in US Entertainment Software Industry Employment (2002-2006)

	2006	2002
US Entertainment Software Industry Estimates Establishments with 5 or More Employees		
Employees	24,007*	N/A
Establishments	514**	432***
Employees/Establishment	46.71	46.71
Estimated 2002 Employment		20,177

* Table C-5

** Table C-1, C-2

*** Table A-1

⁸ Total Direct Employees of 24,007 divided by 514 which is the sum of 91 locations in Table C-1 and 423 locations in Table C-2.

Table D-2: Growth in US Entertainment Software Industry Employment* 2002-2006

2002	20,177
2003	21,073
2004	22,008
2005	22,986
2006	24,007

* Compound Annual Growth Rate of 4.444%.

publishing actually *declined* from 253,300 in 2002 to 243,400 in 2006.⁹

In addition to these figures, there are other references that support the fundamental idea that the entertainment software industry grew dramatically since 2002. Some of these references are shown in Table D-3.

The top half of Table D-3, shows the annual number of members and registered free account users of the International Game Developers Association (IGDA)

since 2002. The IGDA is a non-profit membership organization that advocates globally on issues related to digital game creation. As shown in Table D-3, IGDA membership rose at an annual rate of 43.6% from 2548 in 2002 to 10,829 in 2006. In the same period, the number of registered free user accounts with the IGDA increased from 18,916 in 2002 to 107,977 in 2006, an annual growth rate of 54.6%.

The lower half of Table D-3 reports the annual counts of survey respondents and sample size for the annual Game Developer salary reports that were described earlier in this analysis. For the years 2004 – 2006, the total number of respondent to this survey increased at an annual rate of 19.6% from 3,913 to 5,600. In the same period, the sample size actually used in the Game Developer survey grew at a yearly rate of 51.6%.

While the trend data reported in Table D-3 may not directly confirm the employment trends derived in the location analysis, it adds credence to the basic idea that employment growth in the entertainment software industry has been vigorous since 2002.

Table D-3: Growth Rates in Other Indicators for US Entertainment Software Industry

	NUMBER OF IGDA MEMBERS*	NUMBER OF IGDA REGISTERED FREE USER ACCOUNTS**
2002	2,548	18,916
2003	2,981	56,205
2004	5,471	84,181
2005	6,476	100,896
2006	10,829	107,977
Compound Annual Growth Rates	43.58%	54.57
	GAME DEVELOPER SALARY SURVEY RESPONDENTS	GAME DEVELOPER SALARY SURVEY SAMPLE SIZE
2004	3,913	2,091
2005	6,000	3,879
2006	5,600	4,806
Compound Annual Growth Rates	19.63%	51.61%

* International Game Developers Association, 2006 Annual Report, Page 5 of 9.

** Game Developers Research, Salary Report, 2004-2006, Page 4.

⁹ US Bureau of Labor Statistics, *Employment, Hours and Earnings from the Current Employment Statistics survey (National)*, Software Publishers, NAICS 5112, all employees.

VI. WAGES AND SUPPLEMENTAL COMPENSATION PER EMPLOYEE

For purposes of measuring the entertainment software industry's contributions to the US economy, it is important to consider other measures beyond simple growth in jobs. One such measure is employment compensation. In Table E-1, the annual value added and compensation levels achieved for all publishing industries in the US economy for the years 2002-2005 is shown. This industry grouping (NAICS 511) incorporates all forms of publishing in the US including software publishing (NAICS 5112).

As shown in Table E-1, an industry's value added has three basic components. These are compensation, taxes, and gross operating surplus (GOS). In 2005, the value added for the entire US publishing industry group (including software publishing) was \$150 billion. Of this total, approximately \$75 billion (50%) consisted of employee compensation.

Employee compensation in turn can be divided into two separate categories. These categories are wages and salaries and supplements. For the US publishing

Table E-1: Value Added and Compensation All Publishing Industries (\$ mil)

	2002	2003	2004	2005
Value Added	\$118,993	\$123,346	\$133,640	\$150,244
Components of Value Added				
Compensation	\$71,108	\$71,853	\$72,665	\$75,146
Taxes (various)	\$1,893	\$1,979	\$2,116	\$2,234
Gross Operating Surplus	\$45,992	\$49,714	\$58,859	\$72,864
Total VA	\$118,993	\$123,546	\$133,640	\$150,244
Components of Compensation				
Wages + Salaries	\$58,489	\$57,583	\$57,447	\$59,537
Suppl	\$12,619	\$14,270	\$15,218	\$15,609
Total Comp	\$71,108	\$71,853	\$72,665	\$75,146
Supplements as a Percentage of Wage & Salaries	21.57%	24.78%	26.49%	26.22%

Source: US Bureau of Economic Analysis, Gross Domestic Product by Industry, Compensation of Employees, Publishing Industries (includes software).

Table E-2: Employment Trends in All Publishing Industries as per US Bureau of Economic Analysis

ALL PUBLISHING INDUSTRIES (000)	
2002	998
2003	952
2004	936
2005	939

Source: US Bureau of Economic Analysis, Gross Domestic Product by Industry Accounts, Full-Time and Part-Time Employees by Industry, Publishing Industries (includes software), December 11, 2006.

industry in 2005, about 79% (\$59.5 billion) of total compensation was paid in the form of wages and salaries. The remaining 21% (\$15.6 billion) of total publishing industry compensation came in the form of supplements. Supplements consist of employer contributions for employee pensions and insurance funds and employer contributions for government social insurance.¹⁰

The figures reported in Table E-1 reflect the total amount of wages and salaries and wage supplements paid to employees in the US publishing industry for the years 2002-2005. In order to assess these figures on a per employee basis, it is necessary to divide these values by the number of workers employed in the US publishing industries. The total number of employees in the US publishing industries (including software publishing) is reported, by year in Table E-2. These employee totals are derived by the US Bureau of Economic Analysis and they include both full-time and part-time workers. As shown in Table E-2, the total number of US publishing industry employees declined from 998,000 workers in 2002 to 939,000 in 2005.

The industry values for wages and salaries and for supplements from Table E-1 can be divided by the

employee counts in Table E-2 in order to measure wages and salaries and supplements on a per employee basis. These calculations are provided in Table E-3. As shown in Table E-3, for the US publishing industries as a whole, wages and salaries per employee rose from \$58,489 in 2002 to \$59,537 in 2005. The 2005 increase in industry wages came after wage declines in 2003 and 2004.

The wage and salary estimates in Table E-3 reflect average wages for the entire US publishing industry including software publishing. However the government sources that compile these figures do not separately report wages and salaries for the US entertainment software industry. Accordingly, in this study, an alternative source was used to measure the average wages paid by game software developer firms in the years 2004, 2005 and 2006. These data were derived from the annual *Game Developer Salary Report* that is conducted and reported by Game Developer Research.

In the *Game Developer Salary Report*, the average wages paid to workers in game development firms are shown on a state-by-state basis for 10 states.¹¹ These figures are overall averages in that they combine wage and salary data for seven separate disciplines. These disciplines are: visual arts, programming, game design, audio, production, quality assurance and business and legal.¹² As shown in Table E-4, in 2006, the average wage paid to game developer employees in the top ranked US state was \$79,553. By contrast, in the tenth ranked state, the average wage paid to game developer employees was \$67,200. The simple average wage paid to game developer employees in ten states was \$73,182 in 2006.

The data in Table E-4 reflects average wages and salaries only. These data do not include the various forms of earnings supplements that are used to measure total compensation in the US national

¹⁰ US Bureau of Economic Analysis, *www.bea.gov. Glossary*,

¹¹ Game Developer Research, *The Game Developer Salary Report 2004-2007*, page 43.

¹² Game Developer Research, *The Game Developer Salary Report 2004-2007*, page 44-47.

accounts. For that reason, it is necessary in this study to estimate the supplements that should be added to the average industry wage and salary figures that were shown in Table E-4. This calculation is provided in Table E-5.

In Table E-5, the average game developer wage figures from Table E-4 and increased to reflect the level of earnings supplements achieved, on average, by all

employees in the US publishing industries including entertainment software. The supplement percentages were derived from Table E-1.

As shown in Table E-5, the average compensation paid to employees in the US entertainment software development industry in 2002 was \$81,807. This figures rose to \$92,353 in 2005 and \$92,368 in 2006.

Table E-3: Wages + Salaries per Employee in All Publishing Industries

	2002	2003	2004	2005
W+S (\$ Million)	\$58,489	\$57,583	\$57,447	\$59,537
Employees (000)	998	952	936	939
(W+S)/Employees	\$58,606	\$60,486	\$61,375	\$63,405

Source: Tables E-1, E-2.

Table E-4: Average Wages + Salaries for Game Developer Employees

RANKED STATE	2004	2005	2006
1st	\$76,759	\$79,619	\$79,553
5th	\$69,183	\$71,974	\$72,794
10th	\$65,463	\$67,917	\$67,200
Simple Average	\$70,468	\$73,170	\$73,182

Source: Game Developer Research, The Game Developer Salary Report 2004-2007, page 43.

Table E-5: Total Compensation per Employee for Game Developer Employees

	2002	2003	2004	2005	2006
Average Wages+Salaries*	\$67,289	\$69,447	\$70,468	\$73,170	\$73,182
Supplement Percentage (Table E-1)	21.57%	24.78%	26.49%	26.22%	26.22%
Supplement to Wages+Salaries	\$14,518	\$17,210	\$18,667	\$19,183	\$19,186
Total Compensation per Employee	\$81,807	\$86,657	\$89,135	\$92,353	\$92,368

* Wages+Salaries for 2002 & 2003 derived on the basis of trend in Wages+Salaries for All Publishing. See Table E-3.

VII. TOTAL COMPENSATION AND VALUE ADDED TO US GDP

In this section of the report, the estimated number of game software publishing employees from Table D-2 is combined with the figures for compensation per employee from Table E-5 in order to derive total employee compensation for the US entertainment software industry as a whole. These calculations are reported in Table F-1.

As shown in Table F-1, the total compensation paid to entertainment software publishing employees was \$1.650 billion in 2002. By 2006, total compensation had risen by approximately 34% to \$2.217 billion in 2006. This dramatic increase in industry compensation reflects the combined effects of rapid job growth and significant increases in total compensation per employee.

In earlier sections of this study, employee counts for the entertainment software industry were derived separately for game publishing and game development groups. As noted in Table C-3, these estimates were 9,958 “direct” employees in the US publisher group and 13,638 “direct” employees in the US developer group. In this study, it is assumed that US employees in these two groups do not receive equal compensation for their work. In Table F-2, weighting factors taken from the broader US software publishing industry are used to derive average employee compensation levels for entertainment software employees in each of these two employee groups.

In Table F-2, the average compensation levels for employees in the entertainment software publishing

Table F-1: US Entertainment Software Industry – Compensation By Year

	NUMBER OF EMPLOYEES*	COMPENSATION PER EMPLOYEE**	TOTAL COMPENSATION(000)
2002	20,177	\$81,807	\$1,650,612
2003	21,073	\$86,657	\$1,826,113
2004	22,008	\$89,135	\$1,961,734
2005	22,986	\$92,353	\$2,122,800
2006	24,007	\$92,368	\$2,217,487

* Table D-2

** Tables E-5

¹³ See Table C-3.

Table F-2: US Entertainment Software – Compensation Per Employee By Group

I.	Employees (5 or more per firm)*	9,958 (Pub)	13,638 (Dev)
	Employees (1-4 per firm)**	+173	238
	Total Employees	10,131 (Pub)	13,876 (Dev)
II.	SOFTWARE PUBLISHING		
	Payroll	\$22,332,209	\$12,534,209
	Employees***	÷ \$180,227	\$148,397
	Payroll Per Employee	\$123,912	\$84,464
	Pub	= \$123,912	Dev
		\$84,464	
Pub	= 1.467	Dev	
III.	1	10,131 (P) + 13,876	(D) = \$2,217,487,026
	2		(P) = 1.467 (D)
			(P) = \$113,197.48
			(D) = \$77,160.80

* See Table C-3.

** Allocated on the basis of five or more per firm breakdown.

*** See Tables B-2, B-3A.

and developer groups are estimated using two equations with two unknown values. The first equation uses employee counts for the two groups to weight the unknown values of P for publisher and D for developer. These two unknowns, as weighted, are then set equal to \$2.217 billion, the total entertainment software employee compensation estimated for 2006. The second equation uses data for the software publishing industry as a whole to measure the relationship between the publishing group payroll per employee and the developer group payroll per employee. As shown in Section III of Table F-2, these two equations can then be solved for P and D.

The solutions for the equations in Table F-2 are as follows: average compensation per employee – entertainment software publishing group = \$113,197 per employee. Average compensation

per employee – game software developer group = \$77,161 per employee. These values are used in the subsequent tables in this section of the report.

In this study, we estimated that 9,958 workers were employed by the publisher group firms in the US entertainment software industry in 2006.¹³ Using the employee compensation data from Table F-2, we now can estimate that the total compensation paid to these “direct” workers was \$1.127 billion in 2006 [See Table F-3A].

It is also estimated that 13,638 workers were employed by the developer group firms in the US entertainment software industry in 2006.¹⁴ Using the employee compensation data from Table F-2, we now can estimate that the compensation paid to these “direct” workers was \$1.052 billion in 2006 [See Table F-3B].

¹⁴ See Table C-3.

Table F-3A: US Entertainment Software – Direct Compensation by Group by State Publisher Group

NUMBER OF STATES	NUMBER OF EMPLOYEES*	COMPENSATION PER EMPLOYEE**	TOTAL DIRECT COMPENSATION (\$000)
31	9,958	113,197.48	\$1,127,235

* Table C-3.

** Table F-2.

Table F-3B: US Entertainment Software – Direct Compensation by Group by State Developer Group

NUMBER OF STATES	NUMBER OF EMPLOYEES*	COMPENSATION PER EMPLOYEE**	TOTAL DIRECT COMPENSATION (\$000)
31	13,638	77,160.80	\$1,052,282

* Table C-3.

** Table F-2.

Table F-4: US Entertainment Software – Direct Compensation By State

NUMBER OF STATES	TOTAL DIRECT COMPENSATION GAME PUBLISHERS (\$000)	TOTAL DIRECT COMPENSATION GAME DEVELOPERS (\$000)	TOTAL DIRECT COMPENSATION (\$000)
31	\$1,127,235	\$1,052,282	\$2,179,517

Note: Does not equal Total US Compensation because employees at establishments with less than 5 employees cannot be located by state.

In Table F-4, the estimates for the publishing and developer groups are combined into a single value to reflect the total compensation paid to all direct employees of the US entertainment software industry in 2006. As shown in Table F-4, that value was \$2.179 billion.

The direct compensation value of \$2.179 billion shown in Table F-4 does not reflect the total compensation paid to all US workers as a result of the efforts of the US entertainment software industry. As noted earlier in this report, an industry’s “direct” employment does not capture the full impact of that industry on the US economy as a whole. Direct employment counts omit any recognition that other “input” industries labored to make and sell intermediate products and services that ultimately were used to create the basic product at issue.

In Table C-6, a mathematical model, developed and maintained by the US Bureau of Economic Analysis, was used to measure the “indirect” employees

that benefit from the demand for US entertainment software products. This model suggested that the total number of US entertainment software industry employees (both direct plus indirect) was nearly 81,000 workers in 2006.

In Table F-5, the same model is used to estimate the total compensation paid to both direct and indirect employees of the US entertainment software industry in 2006. As shown in Table F-5, that figure was \$4.107 billion.

Table F-5: US Entertainment Software – Total (Direct & Indirect) Compensation by State

NUMBER OF STATES	TOTAL DIRECT COMPENSATION (\$000)	TOTAL (DIRECT & INDIRECT) COMPENSATION (\$000)
31	\$2,179,517	\$4,106,925

* Reflects a weighted average direct effects multiplier of 1.8843.

**Table F-6: US Entertainment Software Industry
Other Components of Value Added**

	2002	2003	2004	2005	2006*
TAXES ON PRODUCTION AND IMPORTS (ALL SUBSIDIES)					
Taxes: All Publishing (\$ mil)	\$1,893	\$1,979	\$2,116	\$2,234	\$2,389
Employees (000)	998	952	936	939	942
Total Per Employee	\$1,897	\$2,079	\$2,261	\$2,379	\$2,536
GROSS OPERATING SURPLUS (UNADJUSTED)					
Gross Operation Surplus: All Publishing (\$mil)	\$45,992	\$49,714	\$58,859	\$72,864	\$86,267
Employees	998	952	936	939	942
Gross Operation Surplus Per Employee	\$46,084	\$52,221	\$62,884	\$77,597	\$91,579

* 2006 values projected at growth rates achieved in period 2003 to 2004.

**Table F-7: US Entertainment Software Industry
Direct Value Added to GDP (\$mil)**

	2002	2003	2004	2005	2006
Compensation	\$1,650.6	\$1,826.1	\$1,961.7	\$2,122.8	\$2,217.5
Taxes*	\$38.3	\$43.8	\$49.8	\$54.7	\$60.9
Gross Operating Surplus**	\$929.8	\$1,100.4	\$1,384.0	\$1,218.0	\$1,531.8***
Value Added	\$2,618.7	\$2,970.4	\$3,395.5	\$3,395.5	\$3,810.2

* Taxes per employee (Table F-2) times number of game software publishing employees (Table F-1).

** For 2002 - 2004, Gross Operating Surplus per employee (Table F-2) times number of game software publishing employees (Table F-1). GOS for 2005 is assumed to decline such that total value added in 2005 remains unchanged from 2004.

*** GOS in 2006 is assumed to increase at a rate of 25.8%, the same rate of increase achieved in GOS for the period 2003-2004.

Earlier in this report, (see Table E-1), employee compensation was listed as one of three components that make up an industry's value-added. An industry's value-added is the "contribution of industries to the nation's output, or *gross domestic product*. An industry's value added is equal to its *gross output* (which consists of sales or receipts and other operating income, commodity taxes, and inventory change) *minus its intermediate inputs* (which consist of energy, raw materials, semi-finished goods, and services purchased from domestic industries or from foreign sources).

The three primary components of value added are an industry group's return to domestic labor

(compensation of employees), its net return to government (*taxes on production and imports less subsidies*), and its return to domestic capital (*gross operating surplus*).¹⁵ (Emphasis Added)

In this study, the value added measurement to the US economy by the US entertainment software industry is sought. The first component of value added is employee compensation. As shown in Table F-4, the total compensation paid to employees of the US entertainment software publishing industry was \$2.180 billion in 2006. In Tables F-6 and F-7, the other two components of value added for the US entertainment software industry are measured.

¹⁵ US Bureau of Economic Analysis, *Gross Domestic Product by Industry Accounts, Guide, Value Added by Industry*.

Table F-8: US Entertainment Software Value Added Comparisons

YEAR	ENTERTAINMENT SOFTWARE PUBLISHING (\$B)	INFORMATION SECTOR (\$B)
2002	\$2.619	\$483.000
2003	\$2.970	\$489.100
2004	\$3.395	\$529.200
2005	\$3.395	\$555.200
2006	\$3.810	\$579.200
GROWTH RATES		
2002-2003	13.4%	1.3%
2003-2004	14.3%	8.2%
2004-2005	0.0%	4.9%
2005-2006	12.2%	4.3%
2002-2006	10.0%	4.7%

In Table F-6, the production taxes and gross operating surplus reported for all US publishing industries (including software publishing) for the years 2002 through 2006 are shown. Also provided are the total number of workers employed in all US publishing industries for the same years. The reported values are divided by total employees in order to estimate production taxes and gross operating surplus on a per employee basis. These values are then used as inputs in the derivation of production taxes and gross operating surplus for the US entertainment software industry.

In Table F-7, the values of production taxes and gross operating surplus per employee are multiplied by the relevant number of entertainment software publishing employees from Table F-1. These calculations yield estimates of total production taxes and total gross operating surplus by year for the US entertainment software industry. These figures are then combined with the employee compensation figures from Table F-5 in order to derive the value added by the entertainment

software publishing industry to US GDP for the years 2002 to 2006. As shown in Table F-7, the total game industry value added rose from \$2.6 billion in 2002 to \$3.8 billion in 2006.

In Table F-8, compared are the estimated value added for the entertainment software development industry with the value added for the entire US Information Sector as a whole. The US Information sector (NAICS 51) includes all US publishing industries (including software publishing) plus the US motion picture, recorded music, broadcasting, Internet publishing, telecommunications and web search portal industries. These industries, in aggregated, generated \$579 billion in value added to the US economy in 2006.

While the US Information sector as a whole is much larger than the US entertainment software industry, the sector as a whole is growing far less rapidly than entertainment software industry.

As show in Table F-8, the value added to the US economy by the US entertainment software industry

increased [in nominal terms] at a rate of 10% per year since 2002. By contrast, the value added by the US Information sector as a whole, increased by only 4.7% during the same four year period.

Strictly speaking, the trends reported in Table F-8 may be misleading since they track value added estimates in nominal (or current dollar) terms. The data in Table F-8 combine changes in real economic growth with changes driven solely by inflation-induced price increases. For this reason, economists generally prefer to review trend data on value added in “real” or inflation adjusted terms.

In Table F-9, the value added figures for the US entertainment software industry are both converted to real terms and compared to US GDP as a whole. The nominal value added figures are converted to real terms using annual ratios of the real dollar value added to the current dollar added for the Information sector as a whole. As shown in Table F-9, this conversion generally increases the value added for the entertainment software industry for the period 2003 – 2006. For example, in 2006, the real dollar value added of the US entertainment software industry was \$4.615 billion as compared to the current dollar figure of \$3.810 billion for the same year.

Table F-9: Entertainment Software Real Growth and Share of US GDP

	ENTERTAINMENT SOFTWARE VALUE ADDED (\$ BILLION - CURRENT DOLLARS)	TOTAL US GDP (\$ BILLION - CURRENT DOLLARS)	RATIO OF ENTERTAINMENT SOFTWARE TO TOTAL US GDP
2003	\$2.970	\$10,960.8	0.0002710
2004	\$3.395	\$11,712.5	0.0002899
2005	\$3.395	\$12,455.8	0.0002726
2006	\$3.810	\$13,246.6	0.0002876
	ENTERTAINMENT SOFTWARE VALUE ADDED (\$ BILLION - CURRENT DOLLARS)	RATIO: INFORMATION SECTOR - REAL DOLLAR VA TO CURRENT DOLLAR VA	ENTERTAINMENT SOFTWARE REAL VALUE ADDED (\$ BILLION - CURRENT DOLLARS)
2003	\$2.970	1.08102	\$3.211
2004	\$3.395	1.10966	\$3.768
2005	\$3.395	1.15272	\$3.914
2006	\$3.810	1.21123	\$4.615

Table F-10: Entertainment Software Contribution to Real Growth in US GDP

	REAL ANNUAL GROWTH ENTERTAINMENT SOFTWARE VA	REAL ANNUAL GROWTH US GDP		ENTERTAINMENT SOFTWARE RATIO OF GROWTH CONTRIBUTION TO SHARE OF US GDP (TIMES SHARE)
2003-04	17.34%	3.90%	2003	4.45
2004-05	3.87%	3.20%	2004	1.21
2005-06	17.91%	3.30%	2005	5.43

In Table F-10, reported is the real annual growth rate achieved for the periods 2003-04, 2004-05 and 2005-06. As shown in Table F-10, these growth rates were 17.34% in 2003-04, 3.87% in 2004-05 and 17.91% in 2005-06. In two of the three periods reported, the real annual growth rate of the software publishing industry was *more than four times* the real growth for the US economy as a whole.

The high growth rates achieved by the US entertainment software industry were such that

the industry contributed far more than its share to the growth of the US economy as a whole. In current dollar terms, the US entertainment software industry has a modest *share* of the overall US economy. However, the entertainment software industry's contribution to *growth* vastly exceeds its modest current dollar share. As shown in Table F-10, in 2003-04 and 2005-06, the entertainment software industry's growth contribution was more than *four times* the industry's share of the economy.

VIII. CONCLUSIONS

The US entertainment software industry achieved retail sales in the United States of \$7.0 billion in 2005. In the US, unit sales of computer and video games increased from 74.1 million in 1996 to more than 250 million in 2006.

The statistical agencies of the US government do not release detailed information on the US entertainment software industry. The industry classification system used by the US government (NAICS) includes entertainment software publishing within the broader category of all software publishing (NAICS 5112). For this reason, the estimates presented in this report often combine US government and private industry statistics.

On the basis of the calculations described in this report, it is estimated that the US entertainment software industry directly employs more than 24,000 people in 31 states. Of these 24,000 people, it is estimated that at least 10,000 (at 91 locations) are employed by larger publishing firms while at least 13,600 people (at 423 locations) are employed by smaller developer firms.¹⁶ Total US employment, both direct and indirect, that depends on the entertainment software industry now exceeds an estimated 80,000 workers.

Approximately 75% of the employees in the US entertainment software industry are located in one of the six states of California, Washington, Texas, New York, Massachusetts and Illinois. California is the largest employer of entertainment software personnel accounting for approximately 40% of the total number of employees in the US as a whole.

In 2002, the US entertainment software industry directly employed less than 20,200 people. By 2006, with the industry's direct employment at approximately 24,000, industry employment increased at an annual rate of 4.4%. By contrast, in the same period, employment in software publishing as a whole declined from 253,000 in 2002 to 243,000 in 2006.

In 2006, US entertainment software industry employees received total compensation (including supplements) of \$2.2 billion. For the industry as a whole, average compensation per employee from wages, salaries and employer contributions for pensions, insurance and government social insurance was \$92,368. In game publisher or publisher/developer firms, the average compensation per employee was \$113,197. In game developer firms, the average compensation per employee was \$77,161.

¹⁶ We estimate that the entertainment software industry also employs approximately 400 employees in very small establishments that could not be identified to a specific state or location.

In 2006, the US entertainment software industry's value added to US GDP was \$3.8 billion.

The real annual growth rate achieved by the US entertainment software industry exceeded 17.0% in the periods 2003-04 and 2005-06. During the same

years, real growth for the US economy as a whole was below 4.0%. The entertainment software industry makes a disproportionate contribution to real growth for the US as whole. In the periods, 2003-04 and 2005-06, the industry's contribution to real growth exceeded its share of GDP by more than four to one.

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