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United States Producer Price Indexes for Software Publishing
NAICS 511210
ISIC 5820 Software Publishing

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Introduction

The U.S. Bureau of Labor Statistics currently publishes a Producer Price Index for the 2012 North American Industry Classification System (NAICS) industry 511210, Software Publishing. This paper discusses the development and maintenance of this index.

1.   Definition of the service being priced

The primary output of this industry is the provision of computer software and related services to ensure the successful use of the software. Software publishers sell software licenses which grant customers the right to use programs that they have designed and developed. In contrast to establishments engaged in custom software development, in which unique programs are developed and designed to meet the specific needs of individual clients, establishments in the software publishing industry sell licenses that grant customers the right to use standard (non-customized) software programs. These programs are designed for use on personal computers, servers, portable devices, video game consoles, and a variety of other computing devices. Software may be provided by physical transfer on discs or cartridges or by download.

Establishments in this industry engage in computer software publishing, publishing and reproduction, and operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation, and providing support services to software purchasers. These establishments may design and develop software in conjunction with publishing it, or may strictly publish software without being engaged in its design or development. The creation of custom software designed to meet the needs of specific users is excluded from this industry.

There are two main categories of software: system software and application software. System software includes programs that instruct computer hardware and other software applications how to operate. Examples of system software include operating system, network, database management, and development tools and programming language software. Application software includes programs that complete specific tasks or functions. Examples of application software include word processing, spreadsheet, accounting, and game software.

Both system and application software may be sold to individual customers or institutional buyers. Software that is designed primarily to meet the needs of institutional buyers, such as businesses and government agencies, may be referred to as enterprise software.

Other services provided by firms in this industry include technical support, product updates, consulting, implementation, and training services. These services can be delivered in a variety of ways. Technical support services usually consist of a help desk or customer service support number to aid customers if software problems arise. Product updates provide customers with new features and enhancements developed after the software was initially purchased. Software publishers may provide consulting services which aid customers in determining how to use their software most effectively. Through implementation services, software publishers aid their clients in software installation and ensure that the software functions properly with other systems. Software companies also offer training services to

teach their clients how to use the software. The training may be standardized with set topics or objectives for a certain number of days, or it may be customized for the particular needs of an individual client.

Many software companies offer several of these services bundled together in the form of a maintenance contract agreement. For instance, customers may enter into renewable maintenance agreements which provide ongoing technical support, bug fixes, and access to product updates that are released during the time period covered by the maintenance agreement. Software publishers often add new features and functionality to their software products continually. Some software publishers grant clients that have a current maintenance agreement access to all product updates that are released during the maintenance term, including major releases (such as an upgrade from version 4.5 to 5.0) at no additional cost. Other software publishers will allow clients with a current maintenance agreement access to minor releases (such as an update from version 5.2 to version 5.3) but may still charge additional fees if the client chooses to upgrade to a major release.

Maintenance agreements are usually priced as a percentage of the initial license price. Most enterprise software publishers require customers to purchase one year of maintenance at the time the license is initially purchased. After the first year of maintenance is completed, customers are given the option to renew the maintenance agreement. If customers forgo the renewal, they may still continue to use the software license as defined by the licensing terms but will face additional charges for access to technical support, product updates, and other services that had been included in the maintenance agreement.

2. Pricing unit of measure

The unit of measure for software license sales is typically per license. For sales of enterprise software to businesses or other large institutions, one transaction may represent the sale of multiple licenses as well as the price of first year software maintenance. In these cases, the unit of measure is per transaction.

For subscription based licenses, the unit of measure may be per year, quarter, or month, depending on the length of time the service is provided.

For related services such as consulting, training, technical support, and installation, the unit of measure is per engagement. This refers to the entire length of service for one project.

For renewed maintenance transactions, the unit of measure is typically per year.

3. Market conditions and constraints

a. Size of industry

The following table provides size statistics for the U.S. software publishers industry based on the 2007 Economic Census:

2007 NAICS Code	2007 NAICS Title	Number of Establishments	Turnover ($1,000)
511210	Software publishers	8,275	$135,400,841

Source: U.S. Census Bureau, 2007 Economic Census (2012 Economic Census data is not yet available)

According to the 2007 Economic Census, this industry accounts for 48.0 percent of the turnover for NAICS sub-sector 511, Publishing Industries (except Internet). The largest firms classified in NAICS 511210 account for significant portions of both industry revenue and employment in the U.S. According to the 2007 Economic Census, the four largest firms account for roughly 40 percent of industry revenue and 20 percent of industry employment. The 50 largest firms account for roughly 70 percent of industry revenue and 50 percent of industry employment.

b. Special conditions or restrictions

In recent years this industry has faced increased competition from firms that provide on-line access to hosted software on a subscription basis and firms that provide open source software.

Unlike traditional software licenses, open source software source code can be copied, altered, and redistributed free of charge. Firms that offer open source software typically distribute free programs to their customers and earn turnover only by providing support services, such as implementation and consulting. Turnover from these support services is classified in the U.S. as a software publishing activity as long as the software is largely based on a core or standardized open source product offering.   If the turnover generated from providing support services is earned from software products that are dramatically revamped for each client based on their unique needs, the turnover is classified as being derived from custom software development (CPC Class 8314).

Many software firms now offer hosted software, also known as software as a service, in addition to traditional software publishing activities. Providing a client access to software that is not installed directly on the client's own hardware but instead resides on hardware provided by the software firm or a third party is **not** considered a primary software publishing activity in the U.S. Turnover from hosted software is classified in the U.S. as application service provisioning (CPC 83152).

c. Record keeping practices

While software companies may operate multiple local sales offices, pricing data can typically be obtained at the company headquarters.

4. Standard classification structure

NAICS Definition

NAICS 511210, Software Publishers, comprises establishments primarily engaged in computer software publishing or publishing and reproduction. Establishments in this industry carry out operations necessary for producing and distributing computer software, such as designing, providing documentation, assisting in installation, and providing support services to software purchasers. These establishments may design, develop, and publish, or publish only.

Comparison to ISIC Rev. 4 Definition

NAICS 511210 most closely compares to ISIC Class 5820 Software Publishing, which includes publishing of the following types of ready-made (non-customized) software:

- Operating systems
- Business and other applications
- Computer games for all platforms

ISIC Rev. 4 classifies the online provision of software (application hosting and application service provisioning) into Class 6311 Data processing, hosting and related activities, rather than as a software publishing activity within Class 5820. Similarly, NAICS classifies this service into NAICS 518210 Data processing, hosting and related services. However, Class 5820 includes Internet software publishing without traditional publishing. In contrast, NAICS classifies this type of activity, which includes the publishing of game software exclusively over the Internet, into NAICS 519130 Internet Publishing and Broadcasting and Web Search Portals.

North American Product Classification System

The following table lists the services provided by software publishers as defined by the North American Product Classification System (NAPCS). The services listed are those for which there is trilateral agreement between the United States, Canada, and Mexico:

NAPCS Code	Title
1.5.1	Software-related technical support services
1.9	Published software
1.9.1	Published system software
1.9.1.1	Published operating system software
1.9.1.2	Published network software

1.9.1.3	Published database management software
1.9.1.4	Published development tools and programming languages software
1.9.1.5	Published systems software, nec.
1.9.2	Published applications software
1.9.2.1	Published general business productivity applications software
1.9.2.2	Published cross-industry applications software
1.9.2.3	Published vertical market applications software
1.9.2.4	Published utilities software
1.9.2.5	Published home entertainment, education, and computer game software
1.9.2.9	Published applications software, nec.
1.11	Training services, IT-related
2.5	Licensing of rights to use computer software protected by copyright
2.6	Licensing of rights to use intellectual property protected by copyright, except rights to reproduce and distribute software

Comparison to CPC Ver. 2

The following table maps the NAPCS product codes for the Software Publishing industry to the CPC Ver. 2 structure.

CPC code	CPC Title	NAPCS Code
38582	Software cartridges for video game consoles	1.9.2.5
478	Packaged software	1.9
4781	Systems software, packaged	1.9.1
47811	Operating systems, packaged	1.9.1.1
47812	Network software, packaged	1.9.1.2
47813	Database management software, packaged	1.9.1.3

47814	Development tools and programming languages software, packaged	1.9.1.4
4782	Application software, packaged	1.9.2
47821	General business productivity and home use applications, packaged	1.9.2.1
47822	Computer game software, packaged	1.9.2.5
47829	Other application software, packaged	1.9.2.2
		1.9.2.3
		1.9.2.4
		1.9.2.9
73311	Licensing services for the right to use computer software	2.5
		2.6
83132	IT support services	1.5.1
		1.11
83143	Software originals	Industry subject area 711, 8
83152	Application service provisioning	1.3.2
8434	Software downloads	1.9
84341	System software downloads	1.9.1
84342	Application software downloads	1.9.2
84391	On-line games	Industry Subject Area 516, 1.9.1
84392	On-line software	1.3.2
89110	Publishing, on a fee or contract basis	1.9

The products in the two structures are comparable to a great extent. One substantive difference is that the NAPCS includes more detailed products (cross-industry, vertical market, utilities, and other applications software) for the CPC broad category for other application software. Another difference is that software originals, defined as the sale of copyrighted intellectual property provided on a non-contract basis, is not included in the software publishing portion of the NAPCS structure. This is also the case for on-line games, which are primarily offered by Internet publishers and are included in that portion of the NAPCS structure.

5.   Evaluation of standard vs. definition and market conditions

Below is the U.S. PPI publication structure for the software publishers industry.

Index Code	Title
511210	Software publishers
511210P	Primary services
5112105	Software publishing, except games
511210501	System software publishing
511210502	Application software publishing
51121050201	Desktop and portable device application software publishing
51121050202	Other application software publishing
511210503	Technical support, training, and other services related to software publishing
5112106	Game software publishing
511210SM	Other receipts

The U.S. PPI for software publishing closely follows the NAPCS structure, although the NAPCS structure includes more detailed product lines for the application software category. Additionally, the U.S. PPI includes a service line entitled **Technical support, training, and other services related to software publishing**. This service line captures prices for technical support, consulting, and training services for software published by the software publisher. Software publishers may provide these types of services for third party software as well, though in these cases, turnover earned from these activities are not considered to be derived from software publishing activities since the services provided are not for software published in-house.

The U.S. PPI currently collects both new and renewed software maintenance in the software index corresponding to the type of software for which the maintenance is offered. While renewed

maintenance is collected as a stand-alone price, first year software maintenance is typically collected along with the initial license sale as a bundled single transaction price.

Large software companies often establish office locations throughout the world. In some instances, the offices outside of the headquarters country act only as local sales offices or distribution centers. In other cases, these offices engage in software development activities. The U.S. examined a number of international software games publishers and found that some of these firms maintained U.S. office locations that appeared to be contributing to the intellectual property of the game products, either through original development or publishing services or by modifying the content of the games for a North American audience. In those instances where the local U.S. office is primarily engaged in the distribution of games to U.S. markets, the activities of the U.S. office are classified into trade industries. However, in instances where the U.S. office engages in software development as well as other activities associated with economic ownership, such as assuming entrepreneurial risk or owning, setting the price, and arranging the sale of the final product, the U.S. office is classified as a software publisher.

6. National accounts concepts and measurement issues for the area related to GDP measurement

While the sales of packaged systems and applications software are included in the fixed investment accounts (capital accounts), sales of games software are included as personal consumption expenditures. As a result, a distinct index for all software publishing with the exception of games is provided to align index data with national accounts.

7. Pricing method(s) and criteria for choosing various pricing methods

In order of preference, the most common type of prices collected in this industry are 1) unit value prices, 2) component prices, 3) direct prices of repeated services, and 4) model prices. Unit value prices may be calculated with either of two methods. For the first method, the total turnover earned from all sales of a particular type of license for a specified software product to a specified buyer type is divided by the total number of licenses sold in these transactions to calculate the unit value price. This method is most appropriate when the software is generally sold with the same licensing configuration across all transactions (each transaction consists of the same type of license).

The second method is used for complex business or enterprise software, which is often sold in licensing configurations that vary by client. For example, one client may purchase a configuration consisting of two server licenses and 50 client licenses while another client may purchase four server licenses and 80 client licenses for the same software product. Each month or quarter, many software publishers calculate an average percentage by which their final selling prices fall short of the list prices for each of their products. This average discount represents the difference between the total turnover received for all software sales of the selected product that occurred during a specified time period and the total turnover that would have been received if all of the software sales had been transacted at the list price. For these transactions, the unit value price is calculated by applying this average discount to the list price for a selected software license sale. The respondent is asked to update the current list prices for all licenses included in the originally selected configuration and the average discount reflecting sales that took place in the most recent period.

Since software prices can be highly negotiable, unit value prices are preferred in this industry because they capture discounting each reporting period based on current market conditions. However, unit value prices are often reported based on transactions occurring in the previous month or quarter, resulting in lags in data reporting. In addition, unit value prices can still be susceptible to shifts in the buyer mix, as high volume clients may receive greater discounts than smaller clients within the same buyer type. Distortions to the unit value price can occur if the mix of transactions between small and large clients changes significantly.

Component prices may be used for sales of enterprise software if unit prices are not available. In these cases, a recent transaction is selected. These transactions typically consist of the sale of both server-based and client-based licenses as well as first year software maintenance. The respondent is asked to provide the price that would be charged if the selected configuration were to be sold to a similar buyer each reporting period.

Direct prices of repeated services are collected for products that are regularly transacted each reporting period. This method is often used for mass-marketed software offered through retail distribution in which all sales consist of the same license type, rather than client-specific licensing configurations comprised of client and server licenses. This method may also be used for standard tech support offerings or renewed software maintenance offerings in which the price of renewed maintenance is a set fee and is not directly tied to the initial license sale or first year maintenance sale.

Model prices are used when products are transacted infrequently or significant price variation exists between buyer types. In these cases, a representative transaction is selected and the respondent is asked to estimate the price that would be charged each reporting period if a similar transaction were to be sold to a similar buyer. Some respondents have difficulty providing model prices since products can be sold at different prices based on the timing of the sale and the negotiating power of the buyer.

Model pricing is often used to price renewed software maintenance sales in which the price is tied to the initial software and first year maintenance sale. For example, the renewed maintenance price may be calculated as a percentage of the original license price or as an escalated value based on the price charged for first year maintenance. In these cases, the configuration and price for an original license sale transaction and the price charged to renew maintenance for a second year is collected. Each reporting period, the respondent is asked to estimate: 1) the price that would be charged if the original software and first year of maintenance had been purchased one year prior to the repricing period, and 2) the price to renew software maintenance for the selected transaction in the current month.

Most enterprise software transactions priced by the U.S. consist of a unique configuration of licenses based on the specific needs of the client, and many respondents have found it challenging to estimate the original license price used to calculate the renewed maintenance price in future reporting periods. In response to these difficulties, a strategy in which BLS provides respondents with an estimate of the updated price of the referenced software has been implemented to aid reporting of renewed maintenance transactions. With this approach, the month and year in which the original license and first year maintenance sale occurred are collected. Each reporting period, the price of the software

licenses and corresponding first year maintenance are adjusted by the appropriate PPI software publishing index to provide the respondent with an estimate of what the price of the initial purchase would have been if the selected transaction had occurred 12 months prior to the repricing month.

Example:

In this example, the renewed maintenance transaction that is captured in the base period (March 2013) references vertical market application software (classified in the **Other application software publishing** index) that was originally purchased one year prior, in March 2012. For purposes of this example, the price per server license was $10,000 and the price per client license was $2,000 in March 2012. In each reporting period, the date referencing the month and year of the original software license purchase is provided in the item description.

Sample item description (base period – March 2013)

Renewed maintenance for software purchased one year ago. Reference date: March 2012. Vertical market application software publishing. Software A. Version 4.5. Client ID: Client Z. Client type: business.

License description	Quantity	Price per unit	Total
Server license	2	$10,000	$20,000
Client license	15	$2,000	$30,000
Total price of all licenses:			$50,000
Percent of license price charged for first year maintenance:			20%
First year percentage-based maintenance price:			$10,000
Escalator applied to first year maintenance price:			6%
Total maintenance price for year 2:			$10,600

For the April 2013 repricing period, BLS now provides the respondent with an estimate of what the price of the server and client licenses would have been one year prior, in April 2012. BLS generates the estimate of the April 2012 price by multiplying the March 2012 price by the change in **the Other application software publishing** PPI index from March 2012 to April 2012, which for illustrative purposes is 1.5 percent in this example. Note that the reference date remains unchanged in the item description.

Sample item description (current period – April 2013)

Renewed maintenance for software purchased one year ago. Reference date: March 2012. Vertical market application software publishing. Software A. Version 4.5. Client ID: Client Z. Client type: business.

License description	Quantity	Price per unit	Total
Server license	2	$10,150	$20,300
Client license	15	$2,030	$30,450
Total price of all licenses:			$50,750
Percent of license price charged for first year maintenance:			20%
First year percentage-based maintenance price:			$10,150
Escalator applied to first year maintenance price:			6%
Total maintenance price for year 2:			$10,759

The respondent can edit these values if he or she is able to provide a better estimate of the original license price that would have been charged in April 2012. The respondent can also edit the percentage of the license price charged for first year maintenance and the escalator applied to the first year maintenance price as needed. If the respondent submits the data request with no changes indicated, the value of $10,759 will be used as the price to renew software maintenance for one year beginning in April 2013.

8. Quality adjustment methodology

Newly released versions of software programs typically have increased functionality and new features and are therefore not directly comparable to the previous versions. If possible, the price basis of the software is adjusted by using production cost data in order to account for the change in quality when a new software version is released. The production costs for software publishers primarily consist of the research and development (R&D) costs associated with the enhancements made to new software versions. Establishments are asked to estimate the development costs associated with the

enhancements made to the new software version. These costs are then divided by the number of units of the new version that are expected to be sold. If this number is not available, the costs are instead divided by the number of units of the previous version that were sold since this is considered the best available proxy for expected sales of the new version. The calculated per unit development costs are then used to quality adjust the item when the new version is released.   In practice, it can be very difficult to collect this data if the respondent does not have access to the R&D costs or the records are not kept at a detailed, product-specific level. When producer cost data is not available, the price changes between the old and new versions of the improved software product are excluded from the price index.

Software games are often marketed as a series franchise in which the characters within a specific franchise face a new plot line or challenge with the release of each new game within the series. Fans of the selected franchise tend to purchase each new game fairly quickly after its release. However, after the initial demand for the new version abates after several months, games publishers often lower the price of the game to stimulate demand from other buyers. Consequently, as a game progresses in its life cycle and is no longer a new release, its price falls. However, when the next game in the series is released, its new release price tends to be at a level similar to the initial release price of the prior game in the series. Thus, a game franchise tends to exhibit a cyclical price trend in which each new game or version thereof is released to the market at a price point which falls over time, but then returns to a higher level with the release of the next title or version. In recent years, the U.S. PPI has implemented a methodology in which it follows a specific game from its initial release until the next version of the game within the franchise is released. At that time, the U.S. PPI substitutes to the newly released title and directly compares the price of the previous version to that of the new release if the quality of the software is effectively equivalent since the new release now holds the market position that the previous title once held.

By directly comparing the prices, a price increase usually occurs during the month in which the substitution to the new edition is made since its release price is generally much higher than the price of the previous version, which is then at the end of its lifecycle. However, this price increase is the desired effect as it preserves the cyclical pricing pattern within a game franchise. If the price increases were to be factored out during each substitution to a new release within the franchise, the decrease in price that occurs as a title moves from being a new release to an older title would be captured for each version, but the subsequent rebound in price that occurs with the release of the next version would be adjusted out. Consequently, the long term price trend of the franchise would show a steady, linear decline over time, which is not consistent with the cyclical pattern by which games within a franchise are marketed and priced. While the U.S. PPI index for software games has declined since its inception, the decline has exhibited cyclical behavior since the implementation of this methodology in the early 2000s.

In instances when a game substitution occurs, but the new game is not considered to be a close or comparable substitute with the old game and the prices cannot be directly compared, any quality adjustments that occur between the prices of the old and new game are applied by comparing the prices of the games when they are at similar stages in the game lifecycle. For instance, in rare instances when the newly released game is not comparable to the previous version due to significant changes in

the graphics, content, etc, any quality adjustments are made by comparing the initial release price of the new version of the game to the initial release price of the previous version of the game, not the price of the previous version at the end of its lifecycle.

Similarly, in instances when the U.S. PPI measures the final game within a franchise which will be discontinued, and no new games within the series will be released, the U.S. PPI attempts to substitute to a game in a different franchise which is at a similar point in its lifecycle as the final game in the discontinued franchise. Attempts are made to substitute to a game of the same hardware console platform and of a similar genre, such as sports, action, etc.

9. Evaluation of comparability with turnover/output measures

Every five years, the U.S. Census Bureau calculates and publishes turnover data for the software publishing industry in the Economic Census.

The Census Bureau also publishes quarterly turnover data for the software publishing industry.

The concept of output for the software publishing sector is harmonious between the U.S. PPI, Census Bureau, and Bureau of Economic Analysis.

10. Summary

The U.S. PPI pricing methodology attempts to capture discounting in the software publishing industry by offering two methods to collect unit value prices: 1) average price per license and 2) list price minus the average discount. The list price minus average discount option is particularly useful for capturing current price trends among enterprise software transactions, which often consist of a unique configuration of licenses for each client.

For enterprise software companies, a significant amount of turnover is generated from software maintenance services. To ensure that price changes for these services are reflected in the industry price indexes, prices for the initial purchase of software maintenance are bundled with license sales. The prices charged to customers that renew software maintenance are collected as separate transactions. Since reporting for these transactions has proven to be difficult, the U.S. has attempted to assist respondents with providing estimates of the historical license sale prices that are used in these calculations.

The U.S. quality adjusts transactions when enhanced functionality is added to software products, using producer cost data provided directly by respondents. Although quality improvements are routinely added to sampled products, it is often difficult to obtain the specific producer cost data needed to perform these adjustments.