



DIGITS

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The Facebook App Economy

Introduction

With more than 750 million active users around the world, Facebook is today's most prominent social utility to connect with diverse audiences, including friends, family, co-workers, constituents, and consumers. These connections occur not just through Facebook features but through applications ("apps") developed by third parties on top of Facebook Platform.

Launched in May 2007, Facebook Platform enabled anyone to build social apps on Facebook and the web. The announcement of Facebook Platform included "65 developer partners and over 85 applications for Facebook." At the time, the site boasted more than 20 million active users. Now, more than 2.5 million websites have integrated with Facebook, and people on Facebook install 20 million apps every day. These apps range from games like Farmville to music apps like Spotify to charity-oriented apps like Causes.

There are several components of Platform. One component is the ability for developers to build apps on Facebook, such as game developer Zynga's popular "Words With Friends" and "Mafia Wars." But Platform also includes other components of the Facebook ecosystem such as social plugins including the "Like" button, the Comments plugin, and the Activity feed, all of which enable developers to integrate with Facebook. Another element of Platform, Login with Facebook, permits users to log into websites using their Facebook credentials. When people use their Facebook credentials to log into *The New York Times*, for example, they see the activity and stories that their friends have recommended.

Each of these components of Facebook Platform creates jobs, and each of those jobs contributes value to the economy. For example, the existence of the "Like" button creates economic value by enabling people to share their experiences online with their friends. These friends provide increased referral traffic for companies' websites, which in turn creates value for those companies, which in turn results in hiring new employees and retaining existing ones, which in turn results in those employees making purchases and paying rent or making mortgage payments.

Likewise, anyone can build an app on Facebook and begin earning revenue. If the app becomes popular, a developer may hire additional developers to add new features. If the app becomes even more successful, the founder may hire even more developers to build a second or third or fourth app. And if that single developer becomes a blossoming company, then it must hire financial managers, a legal team, a public relations team, and clerical staff. Ultimately, many jobs are created, and the company contributes significant value to the economy.

Gaming is one of the most successful verticals on Facebook Platform, and Zynga is a leading gaming company. Zynga was founded in 2007 and quickly established itself as one of the most prominent social gaming developers. After developing successful games like Farmville, the company now has more than 2,000 employees and an estimated valuation of \$15-\$20 billion. Similarly, Playfish, another Facebook Platform game developer that was founded in 2007, was acquired by Electronic Arts for \$300 million in 2009. Playdom was founded in 2008 and acquired by Disney for \$763.2 million just two years later.

The creation of Facebook Platform has also spawned an entirely new industry: developer consultants and agencies who build social apps for others. For instance, Facebook offers a list of Preferred Developer Consultants – experienced developers who build apps on behalf of other businesses and understand the social and technical capabilities of Platform. Businesses looking for assistance in building Facebook apps can choose from the publicly available list of 90 Preferred Developers with 170 offices worldwide. Each of these consultants employs not only developers, but also designers, sales people and other functions to service the business and its clients. All of these firms add jobs to the economy and create economic value.

Because Platform is open, the Facebook ecosystem is available to a broad community outside of Facebook, and entrepreneurs have created new businesses and added new jobs to the economy. We refer to this economic phenomenon as the “Facebook app economy.”

This study attempts to determine the employment impact of that app economy.¹ The study uses anonymized data provided by Facebook to evaluate both jobs created by the app economy and the value it contributes to the U.S. economy.

The study leaves to future research efforts an assessment of several additional aspects of the value created by Facebook Platform. Specifically, it does not measure the value of referral traffic derived from Platform, nor does it measure value generated by social plugins, Connect authentication, or Connect apps. In addition, it does not attempt to measure the value consumers derive from free experiences, such as games, that they might pay for elsewhere. It also does not assess the value of efficiencies created by apps, such as recommendations from friends found through apps. It does not assess the value of increased brand loyalty attained through Platform, increased consumer engagement, increased access to information about goods and services, or the unique contribution of the “social” element to these value propositions. Finally, Facebook’s economic impact extends beyond the Facebook Platform and beyond the U.S., including U.S. and international impact from advertising, businesses that use

¹ The study measures the employment impact of the Canvas application economy, but does not attempt to quantify the impact of applications built on external websites.

Facebook Pages, and user-to-user interactions. These additional areas of value are ripe for future research.

Canvas Apps

Canvas Apps are “web apps that are loaded in the context of Facebook” in a Canvas Page.² Canvas Apps reside on a Canvas page and can be accessed by users either through bookmarks, search, posts in news feeds, or notifications. Before accessing a Canvas App, a Facebook user has to grant permission to the app. By using the app, the user can take advantage of features that are more valuable to her because they incorporate social connections to her friends.

Some apps are free to use, but others may require payments to enable certain features. For these transactions, payments are made by using Facebook Credits.³ One U.S. dollar is worth 10 Facebook Credits. Developers receive 70% of the dollar value of payments made using Facebook Credits.

Canvas Apps can also include advertisements on the application itself, which generates revenue for the App developer. In addition to any ads a developer places in his application, Facebook’s own ads are shown in the right sidebar, a practice that is known as “pixel share.”

Data

In the dataset, the number of U.S.-based developers, Monthly Active Users (MAU), Daily Active Users (DAU), and credits of each app are available for 25,345 apps. For our purposes, we aggregate the apps at the firm level, i.e., if a firm has three apps, we sum up MAU, DAU and credits for the firm. In total, there are 8,308 firms. This data represents U.S. firms and unique U.S. users.

In order to estimate employment at the firm level, we hand collected the number of employees for 161 firms from sources such as Crunchbase.com, Glassdoor.com, and LinkedIn.com. If the number of employees was given as a range, we took the mean value of the range. We excluded 13 firms, such as Blizzard Entertainment, Electronic Arts, and Yahoo from our sample because we could not identify the proportion of Facebook induced full-time employment. The following is a comparison of our hand-collected sample and the overall sample.

MAU	Count of Firms	Percentage	Count of Firms	Percentage
0-1,000,000	128	86.49%	8273	99.58%
1,000,000-2,000,000	8	5.41%	19	0.23%
2,000,000-3,000,000	4	2.70%	7	0.08%
3,000,000-4,000,000	2	1.35%	2	0.02%
4,000,000-5,000,000	1	0.68%	2	0.02%
6,000,000-7,000,000	3	2.03%	3	0.04%

² <https://developers.facebook.com/docs/guides/canvas/>

³ Required as of July 1st, 2011.

7,000,000-8,000,000	1	0.68%	1	0.01%
More than 8,000,000	1	0.68%	1	0.01%
Total	148	100.00%	8308	100.00%

Estimation

The estimation of the employment impact of the Facebook app economy in the U.S. consists of three components:

- jobs created in the app industry (direct employment),
- jobs created in other sectors of the economy (indirect employment), and
- the economic value of those jobs.

Employment in the App Industry

The number of employees of each firm would be a function of the number of developers and the number of active users (i.e., MAU and DAU). Using the data of 148 firms, we estimate the following linear and log-linear models:

$$\text{Model 1: } NoEmployee = \alpha \cdot DAU + \beta \cdot NoDeveloper$$

$$\text{Model 2: } NoEmployee = \alpha \cdot MAU + \beta \cdot NoDeveloper$$

$$\text{Model 3: } \log(NoEmployee) = \alpha \cdot \log(1 + DAU) + \beta \cdot \log(NoDeveloper)$$

$$\text{Model 4: } \log(NoEmployee) = \alpha \cdot \log(MAU) + \beta \cdot \log(NoDeveloper)$$

The following shows the estimation results:

	Model 1	Model 2	Model 3	Model 4
α	3.61E-5 (<.0001)	1.04E-5 (<.0001)	0.2887 (<.0001)	0.2404 (<.0001)
β	0.6344 (<.0001)	0.5857 (<.0001)	0.3074 (0.0018)	0.2671 (0.0022)
n			148	
<i>R-squared</i>	0.4414	0.4324	0.8515	0.8730

* p-value in the parentheses

We chose the model with the highest R-squared, Model 4, to estimate the total number of employees. R-squared refers to the fraction of variance explained by a model. It predicts how good the model is at predicting employment. Generally, the higher the R-Squared, the better prediction one can obtain. Using Model 4, we estimate the number of employees employed by third party developers to be 53,434. This number does not include the employment for the other types of apps (Connect Apps and In-tab Apps).

Employment in Other Sectors

The jobs created in the app economy stimulate the creation of additional jobs in other sectors of the U.S. economy in two ways. First, jobs are created at businesses that supply app developers. Second, jobs are created as a result of household spending based on the income earned by employees at both app developers and businesses supplying app developers.

Several studies have established employment multipliers for related industries. Josh Bivens (2003) found that the employment multiplier in the communication sector for the U.S. economy is 2.52, i.e., one job in communication sector creates 2.52 additional jobs in other sectors.⁴ Similarly, Raul Katz at Columbia University (2009) found that each job created through the broadband stimulus program creates 2.42 additional jobs on a national level.⁵ The U.S. Bureau of Economic Analysis (BEA) calculates a Regional Input-Output Modeling System (RIMS II), a general equilibrium model of the economy.⁶ RIMS provides employment multipliers for specific industries on the state level. For the industry “Internet and other information services,” RIMS states that for the most populous state, California, the creation of one job leads to 3.41 additional jobs in California alone.

Assuming employment multipliers of 2.42, 2.52, and 3.41, we calculate the total number of employees in other industries supported through the direct employments in the app industry as 129,310, 134,654, and 182,210 respectively.

Economic Value

The value of direct and indirect employment generated through the Facebook App Economy is based on the wages and benefits paid to these employees. We compute the economic value of direct employment in the app industry using three different estimates of average salaries that we collected from various third parties. First, we collected the average salaries of 63 firms, out of 148 firms for which we have the number of employees, from indeed.com. The mean value of the average salaries of these 63 firms is \$66,762. Since many firms in app industry are startup companies, we also collected the average salary of startup companies from simplyhired.com and PayScale.com. The national level average salary of overall startup companies is \$61,000⁷ and the median salary of IT startup companies is \$64,300.⁸

Next, we estimated the value of employee benefits since total employee compensation consists of benefits in addition to base salary. The Bureau of Labor Statistics (BLS) reports that the salary accounts

⁴ Josh Bivens, “Updated Employment Multipliers for the U.S. Economy,” Working Paper No. 268, Economic Policy Institute, Washington, D.C., August 2003: 23 <www.epi.org/workingpapers/epi_wp_268.pdf>.

⁵ Katz, R.L. and Suter, S. (2009). Estimating the economic impact of the broadband stimulus plan. Columbia Institute for Tele-Information Working Paper.

⁶ US Department of Commerce, Bureau of Economic Analysis. Regional multipliers: A user handbook for regional input-output modeling system (RIMS II). Third edition. Washington, D.C.: U.S. Government Printing Office. 1997.

⁷ <http://www.simplyhired.com/a/salary/search/q-start+up+company>

⁸ <http://bostinnovation.com/2011/01/27/startup-salary-hotspots-how-does-boston-compare/>

for about 70% of employee compensation.⁹ Hence, we use a multiplier of 1.43 to derive the total compensation from average salaries. Using this multiplier, the overall compensation (salary and benefits) in the app industry results in a total between \$4.66 and \$5.10 billion.

Direct Employment	Average Salary	Average Compensation	Total Compensation App Industry
	\$66,762	\$95,470	\$5,101,325,812
53,434	\$64,300	\$91,949	\$4,913,202,866
	\$61,000	\$87,230	\$4,661,047,820

For jobs created outside of the app industry, salaries are best reflected by the national average wage index as reported by the U.S. Social Security Administration. For 2009, the latest index available, the national average salary is \$40,712.¹⁰ Using the same multiplier of 1.43, we derive \$58,218 as the average total employee compensation (salary and benefits). We arrive at the total compensation (for indirect and induced employment) by multiplying the number of jobs created in other sectors by the national average compensation. As noted above, this indirect employment figure ranges from is derived by multiplying the direct employment with the employment multiplier. It ranges from 129,310 to 182,210. Accordingly, we estimate that total compensation for indirect employment is valued between \$7.53 billion and \$10.61 billion.

Direct Employment	Indirect and Induced Employment	National Average Compensation	Total Compensation (Indirect and Induced Employment)
	129,310		\$7,528,169,580
53,434	134,654	\$58,218	\$7,839,286,572
	182,210		\$10,607,901,780

The overall compensation – the sum of wages and benefits earned in the app Industry and in jobs created through the app industry – is estimated to be between \$12.19 billion and \$15.71 billion dollars.

Conclusion

As a result of analyzing the aforementioned factors and data, a conservative estimate of the employment impact of developers building apps on the Facebook Platform in the United States in 2011 is 182,744 full time jobs. In other words, at least 182,744 jobs were added to the U.S. economy as a result of the Facebook App Economy. Similarly, these economic models suggest that a conservative estimate of the total employment value of Facebook’s app economy is \$12.19 billion. Using more aggressive estimates, the Facebook App Economy created 235,644 jobs, adding a value of \$15.71 billion dollars to the U.S. economy.

⁹ <http://www.bls.gov/news.release/ecec.nr0.htm>

¹⁰ <https://www.socialsecurity.gov/oact/cola/AWI.html>

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