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打破多邊市場策略之下的市場壟斷

－以奧多比公司為例

Breaking market dominance from multi-sided

market strategy: The case of Adobe

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口試委員會審定書

題目：打破多邊市場策略之下的市場壟斷

—以奧多比公司為例

　　本論文係楊衡君（學號 R00725014）在國立臺灣大學
資訊管理學系、所完成之碩士學位論文，於民國 102 年 7 月
3 日承下列考試委員審查通過及口試及格，特此證明

口試委員：

所　　長：

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在台北的這兩年研究生活實在是既苦澀又甜蜜。

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楊衡　于教研館

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摘要

雙邊市場策略目前在企業界被廣泛採用，對於經營電子商務的網路公司來說尤甚。企業透過雙邊市場中兩組不同消費族群產生的網路外部性，發展出向其中一方客群收費而補貼另一方客群的策略，使其雙邊的消費族群有效的相依成長。但是根據某些潛在證據顯示，一旦雙邊平台壟斷了整個市場，很可能會剝奪其中一邊消費者的權益，卻因為雙邊市場的特性，兩邊消費者的利害關係切割得非常清楚，補貼方跟付費方之間沒有利益的連結，導致不滿意的消費者難以伸張權益。在本研究中，我們以奧多比公司（Adobe）的 PDF 軟體雙邊平台做為研究案例，我們改變了以往從企業觀點切入的方式，而是從消費者的角度進行探討。分析結果顯示，顧客忠誠度對於企業壟斷程度有顯著的影響。此研究結果對於多邊市場中不論是公司端或客戶端皆有貢獻，使公司能從滿意的消費者中維持長期的盈利能力。

關鍵字：雙邊市場、多邊市場、反壟斷、顧客滿意度、顧客忠誠度、Adobe

Abstract

Two-sided market strategy, the strategy that develops an effective way to create a growing user base, is widely used nowadays especially in e-business. For an online company, it is indeed an useful way to keep the two distinct user groups getting larger, but some evidences suggest that once the company dominates the market and even becomes monopoly, it may deprive the rights and interest of the money side; while the clearly stake-separated business model makes the consumers hard to voice their indignation, because the huge user base that grounded on the subsidy side has no stakes connected with the money side. In this research, we take Adobe's PDF (Portable Document Format) software as our research focal case. The analysis results show that customer loyalty can have significant impact on the degree of monopoly. The results can provide important contributions for multi-sided markets, both for firms and consumers.

Keywords: Two-sided markets; Multi-sided markets; Anti-monopoly; Customer satisfaction; Customer loyalty; Adobe

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1. Introduction

In response to the dissatisfaction of their consumers, Adobe finally adjusted its bundling strategy, and made notable functional changes of Adobe Reader and Acrobat in its latest Creative Suite edition (CS 6.0), which also includes the launch of its cloud service, Creative Cloud. We regard it as a positive and essential response that Adobe gave to both its PDF readers and writers -- the two-sided markets.

Two-sided or multi-sided markets, also known as two-sided networks, markets that have at least two distinct user groups that provide each other with network benefits, are widely used by service firms to leverage network effects (L.Katz and Shapiro 1985, Rochet and Tirole 2002). Since the user base increases rapidly once the firms successfully leverage network effects, they are likely to dominate the market, resulting in an oligopolistic or monopolistic market (Rochet and Tirole 2002). However, some evidence suggests that the market share might have a negative impact to customer satisfaction, especially for the writer side users (i.e., the money side users, who pay to use the software) of our focal case, Adobe. Some most frequently mentioned complaints by writer side users include frequently updating without sensible products improvement, charging sky-high prices (and charging much higher in other countries than in the U.S. for exactly the same product), and asking very detailed personal data (e.g., teacher's
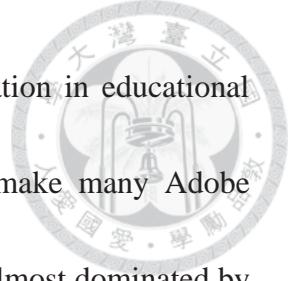
staff paycheck stub or ID, student's transcript) for product registration in educational version, etc. Although the special features of two-sided market make many Adobe customers unhappy, they have little alternatives since the market is almost dominated by Adobe.

In this research, instead of taking the popular perspective of looking at how service firms can leverage the benefits of network effects in two-sided markets (Rochet and Tirole 2006), we take a consumer perspective to see how consumers can break the market dominance and restore their market freedom. Adobe's PDF (Portable Document Format) software serves as the focal case of our analysis. Adobe distributes its reader software free of charge to create demand for its writer. The bigger the reader network (i.e., customer base), the stronger demand of the writer, and thus the more profit Adobe can have. We show that the satisfaction gap between the two sides can be a key driver for Adobe customers to break the market dominance. Our results provide important contribution for multi-sided service markets: a long-term profitability for firms from satisfied customers.

2. Literature Review

The reviewed literatures included numerous findings related to the impacts of two-sided market and network externality, which are the foundations of the market structure of our focal case, Adobe's PDF software. As long as the numbers of users from both sides continue to grow, it may turn into a difficult situation for unhappy customers to have better alternatives once the firm takes all the market share. Therefore, we reviewed the related works about the monopolistic firms in two-sided markets and also the key influential factors of customer satisfaction.

2.1 Two-Sided Markets and Network Externality

Previous studies focus mostly on the benefits that two-sided networks have for the companies, and the proper pricing strategies they should apply (Rochet and Tirole 2002, Rochet and Tirole 2006), as well as focus on the advantages that large market which enhances the network externality (Farrel and Saloner 1985, L.Katz and Shapiro 1985, L.Katz and Shapiro 1986). Rochet and Tirole (2004) have proposed a formal definition of two-sided market:

"A market is two-sided if the platform can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side by

an equal amount; in other words, the price structure matters, and platforms must design

it so as to bring both sides on board."

According to this definition, the major difference between traditional one-sided market and two-sided market is the feature of the consumers. In the two-sided market they mutually rely on each other side in demand. The platform value for one side is determined by the amount of users of the other side, this is the characteristic of network externality. The whole structure is illustrated in Figure 1 (Eisenmann 2006). Therefore, in order to make use of this network structure, the platform will try to attract users from one side by subsidizing them, and let the network effects help the growth of the other side.
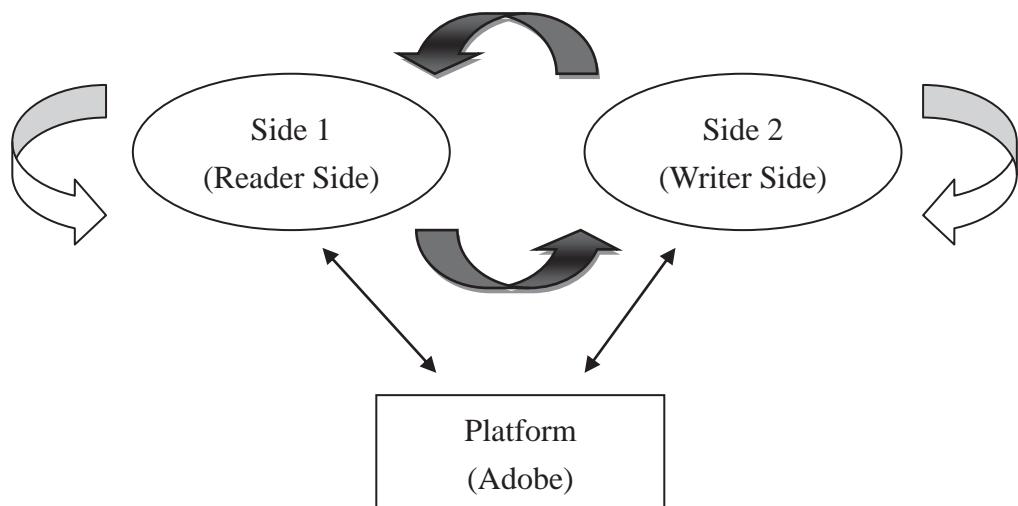

Figure 1. The Structure of Two-Sided Network

Adobe's PDF software is a classic example of two-sided market, the subsidy side is the user of Adobe Reader (the reader), and the money side is the user of Adobe Acrobat

(the writer), with fully making use of this network feature, Adobe's user base grows

rapidly and holds nearly the whole market share in PDF reader and writer markets. The

following figure explains the pricing more clearly in two-sided networks. At the very

beginning, Adobe wanted to set the right price to charge both its user groups in a

two-sided network, since the traditional pricing logic finds prices that maximize the

revenue (price * quantity) under each side's demand curve. While in two-sided networks,

such pricing strategy is not the best choice, because the user base on the reader side

drives potential users on the writer side, it can gain better revenue since the demand

curves are not fixed (as illustrated in Figure 2), writer's demand curves shift outward in

response to growth in the user base on the reader side (Parker and Van Alstyne 2005).
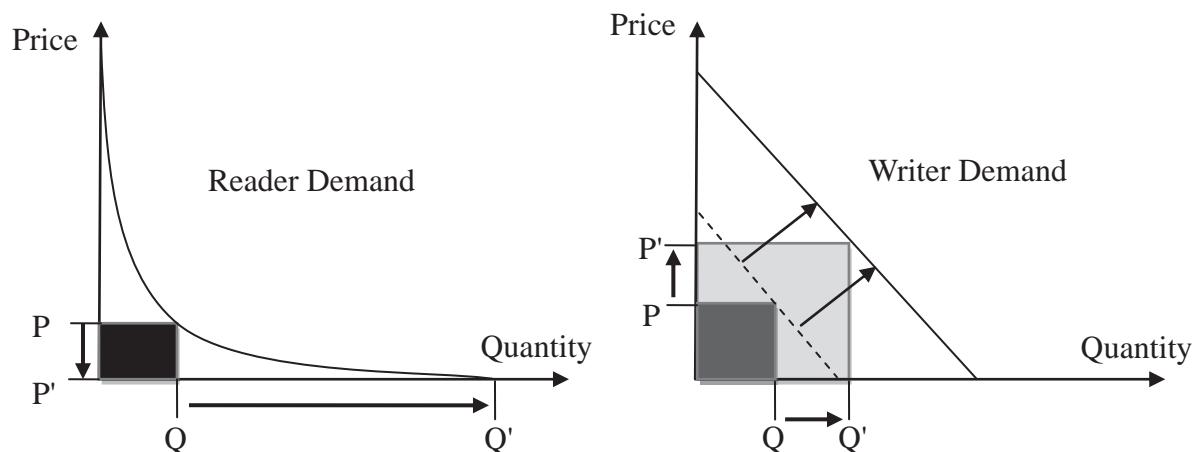

Figure 2. Pricing in Two-Sided Markets

Adobe changed its pricing strategy and made its reader product freely available,

they subsidize the more price sensitive side (the reader side), and charge the side (the

writer side) whose demand increased closely related to growth on the other side

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(Gallaugher and Wang 2002). By utilizing network effects, the increasing user base in subsidy side successfully creates demand for the PDF writer, the network's money side.

Researchers usually divide the multi-sided platforms into the following main categories: brokerage, media, payment card and software platform. Brokerage, like the online auction website, is a platform for buyers and sellers; media, for example, the newspaper, which has readers and advertisers; payment card, for example, the credit card, which has cardholders and merchant; and our focal case, Adobe's PDF software, belongs to the last category, software platform, which has reader software and writer software. Here we organized several common examples of these multi-sided platforms in Table 1 (Evans and Schmalensee 2005, Parker and Van Alstyne 2005).

Table 1. Examples of Multi-Sided Networks

Multi-Sided Platform	**Side One**	**Side Two**
Adobe PDF products	Reader user	Writer user
Microsoft Operating System	Application developer	End user
Video Game Consoles	Game player	Game developer
Credit Cards	Cardholder	Merchant
Media (Newspaper, Television)	Reader/Viewer	Advertiser
Facebook, Google	Web surfer	Advertiser
eBay, Amazon	Buyer	Seller

Note: Side one is the subsidized side; Side two is the profit-making side.

2.2 Monopoly Platforms in Two-Sided Markets

Earlier literatures have analyzed the pricing structure of monopolistic firms in multi-sided markets (Evans 2003, Evans and Schmalensee 2005, Armstrong 2006). The recent work of Weyl (2010) provides general measure of market power, however, should that once the two things get together, that is, a monopolized two-sided platform, may not be a good result to both sides consumer. According to Ellison and Fudenberg (2000), a monopoly software supplier may provide more upgrades than is socially optimal, and tend to bundle unrelated products to make more profit (Bakos and Brynjolfsson 1999). We recently found an unapparent yet increasing din of criticisms of Adobe, mainly because of their overly frequent number of update and sky-high price, to proof this not groundless, we also observed a great many complaints from *dearadobe.com*, which is a forum focuses on collecting the grips about Adobe around the world. We classified the top 100 popular complaints into eight groups (see Figure 3) to help us better develop our research questionnaires items more accurately. Each popular complaint has average 200 votes by those who agree with it. The following three complaints are the most noticeable ones -- the annoyingly frequent products updating without necessities (21%), the poor performance of products (21%), and the sky-high price of products (20%).
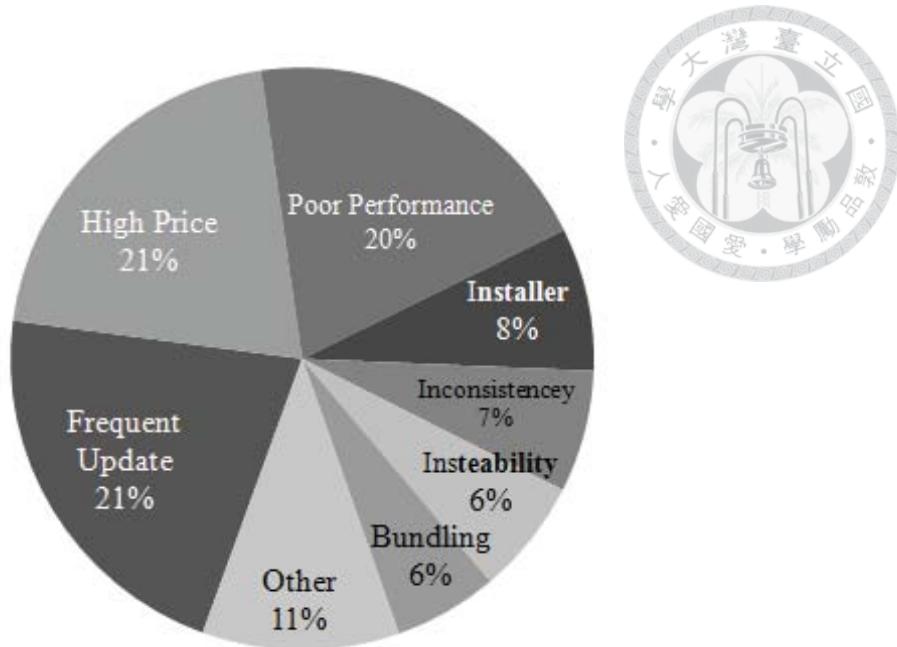
Figure 3. Most Mentioned Complaints about Adobe

(Source: http://dearadobe.com)

The high degree of monopoly let Adobe have the power to raise its price, and forms the price discrimination between nations (Ellison and Fudenberg 2000); moreover, to consolidate its irreplaceable format, Adobe keeps asking users to keep up with the latest version update. Consumers are hard to change this passive situation; one potential reason we observed is there are no real linked interests between the two sides, complaints from the writer side can not reach to the reader side. Therefore, if the reader side stays satisfied, the writer side, which contributes Adobe's profitability, has to endure relatively unfair treatment.

In this research, we consider the consumers of the two networks are from dissimilar demographic segment: they have different income, different price sensitivity

(Eisenmann, Parker et al. 2006, Weyl 2010), and different demand. The heterogeneity

will result in what we called "the distance of two side" in our research.

2.3 Customer Satisfaction and Customer Loyalty

Customer satisfaction is said to have a positive effect on a firm's profitability

(Anderson, Fornell et al. 1994), therefore, it is one of the factors that we concern in our

study. Fornell (1992) developed the structural equation model of customer satisfaction

measurement - Sweden Customer Satisfaction Barometer (SCSB), a national

measurement for estimating the customer satisfaction. Later in 1994, Fornell adjusted

the original model, and American Customer Satisfaction Index Model (ACSI) was

launched (Fornell, Johnson et al. 1996). ACSI model provides important antecedents of

customer satisfaction: customer expectations, perceived quality, and perceived value.

Each construct represents a different aspect of customer attitudes. Customer complaints

and customer loyalty were introduced as consequences (Figure 4).
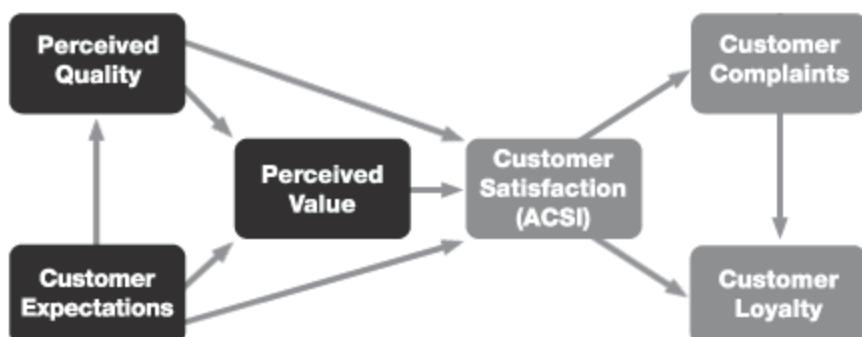
Figure 4. ACSI Model
(Source: http://www.theacsi.org/)

The measurement variables for each construct are organized into the following table (Table 2). Each construct has one to three measurement variables.

Table 2. Measurement Variables in ACSI Model

| Construct	Measurement Variables
Customer expectation	1. Overall expectation of quality 2. Expectation regarding customization 3. Expectation regarding reliability
Perceived quality	1. Overall evaluation of quality experience 2. Evaluation of customization experience 3. Evaluation of reliability experience
Perceived value	1. Rating of quality given price 2. Rating of price given quality
Customer satisfaction (ACSI)	1. Overall satisfaction 2. Expectancy confirmation/disconfirmation 3. Performance comparison with ideal product
Customer complaints	1. The customer complained formally or informally.
Customer loyalty	1. Repurchase likelihood 2. Price tolerance (increase) given repurchase 3. Price tolerance (decrease) to induce repurchase

(Source: http://www.theacsi.org/)

2.4 Hypotheses

According to the above literatures and the second-hand information, we can come up with the following assumptions about monopolized multi-sided markets: an oligopolistic or monopolistic firm not only creates positive benefits through network effects (Rochet and Tirole 2002) but also has the power and intension to continuously upgrading its software or services (Ellison and Fudenberg 2000). For our focal case Adobe, the PDF software is known for its frequent update for both writer and reader side. Based on the above statement, we propose the following hypothesis.

H1: In a two-sided PDF market, the degree of monopoly positively influences the software function.

As a two-sided platform, Adobe gains all profit from its writers while subsidizes its readers, in order to hold its profitability, the requirements and controls over writers are also more. Adobe is being criticized about its high price for writers, and whenever there is a new version release, the price is raised again. Besides, its bundling strategy, which makes consumer's willingness to pay higher (Venkatesh and Kamakura 2003), also confused consumers since the lack of transparency and let them unable to estimate the real value and reasonable price of each software and function (Adams and Yellen 1976).
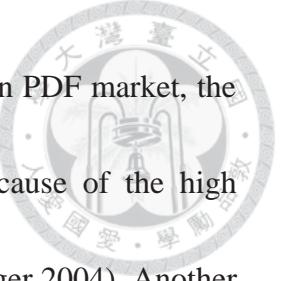
Under the circumstances that Adobe has achieved nearly monopoly in PDF market, the writers have no choice but to put up with the sky-high price because of the high switching cost (Csorba 2002, Weyl 2010) or the formed habit (Reisinger 2004). Another thing that is being criticized is the privacy issue. Adobe asks their users of educational version product for very detailed personal data (e.g., staff paycheck stub, employment letter or ID) to prove their identities rather than purely educational email addresses. Readers on the other hand, don't need to suffer from these troublesome matters.

In two-sided networks, the subsidy side enjoys all the services for free or for less charge. For readers in our Adobe case, the only things they concern about are the using experience, convenience and functionality of product. To fulfill the needs, it is best for them that more people join the reader side and use the same product, they seek for an unified and common format that everyone can open files across different platforms without problems. In this case, the monopoly power can not only enhance the network externality but also create standardization, the Portable Document Format published by Adobe also has become an ISO-norm, which attracts more free readers to enlarge the company's user base. Moreover, according to Fornell, Johnson et al. (1996), customer loyalty is a consequence of customer satisfaction. Therefore, we propose the following hypotheses based on the above study.

H2: In a two-sided PDF market, the software function positively influences the user experience.

H3: In a two-sided PDF market, the user experience positively influences the reader satisfaction.

H4: In a two-sided PDF market, the reader satisfaction positively influences the customer loyalty.

According to the literatures, customer satisfaction has a positive effect on a firm's profitability (Anderson, Fornell et al. 1994), and customer loyalty is a consequence of customer satisfaction (Fornell, Johnson et al. 1996). Thus, we assume that the market share of one firm is influenced by the customer loyalty.

H5: In a two-sided PDF market, the customer loyalty positively influences the degree of monopoly.

3. Research Model and Methodology

3.1 Research Model

According to the literatures, we developed our research model shown in Figure 5. The model forms a chain from degree of monopoly to software function, user experience, reader satisfaction and customer loyalty. The customer loyalty links back to the degree of monopoly, ultimately forms a loop.
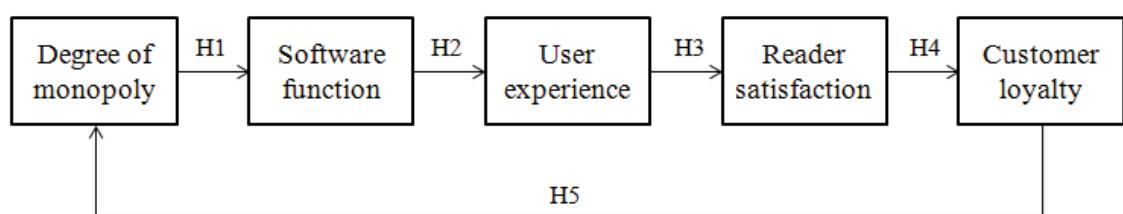
Figure 5. Research Model

A.   Degree of monopoly: the degree of market concentration. The market we mentioned in this study is PDF related industry.

B.   Software function: this variable is used for measuring the completeness and practicability of the software and service.

C.   User experience: a user's attitudes, emotions and responses about using Adobe PDF software.

D.   Reader satisfaction: the overall satisfaction of reader side users.

E.   Customer loyalty: a user's willingness to keep using the product and the

willingness to recommend the product to others.

3.2 Research Design

Based on our research purpose, research model and the reviewed literatures, we need to collect data from Adobe PDF software users, we designed two different questionnaires for each side, and used multiple-item questionnaires as the measurement scale for the research. We adopt the 5-point Likert Scale, letting participants choose from one to five levels of agreement, with anchors ranging from 1 (strongly disagree) to 5 (strongly agree). We used SPSS to conduct reliability analysis and principle component factor analysis with varimax rotation, it is suggested to trim those indicators with loading which less than an absolute value of 0.5, and form the variables with qualified factors. Finally, we used partial least square (PLS) to test the path coefficient and significance of our model. In addition, to prevent the bias during the answering process, we designed prevention mechanism in our online survey to prevent the participants from returning to the previous question item when they receive new information.

3.3 Sampling and Data Collection

The target candidates of our study are both the two sides users of Adobe's PDF software, who use Adobe Reader or Adobe Acrobat (the Writer) as habitual PDF software. In order to fit in with the structure of two-sided market, we designed two versions of questionnaires, one for the readers, and one for the writers. We assumed that all the writers are simultaneously the readers as well, candidates should choose their own questionnaire respectively depends on whether they only use Adobe Reader or they also use Adobe Writer. The data was collected from May 3 to, 2013. We first posted the online survey on related forums and social network platforms. We have conducted two pretests and the questionnaire was adjusted to improve the readability and reliability based on the respondents' feedback. We collected 126 reader samples and 41 writer samples. After deleting the invalid samples, we have ultimately 109 valid samples from readers and 33 valid samples from writers.

3.4 Demographic Analysis

The demographic information of the sample is shown in Table 3. To first focus on the reader side, our sample consisted of 64.8% male respondents and 35.2% female respondents. Age distribution shows that 84.5% of the respondents were 20-34 years old, and almost 70% of our respondents were students. Most of our respondents were using
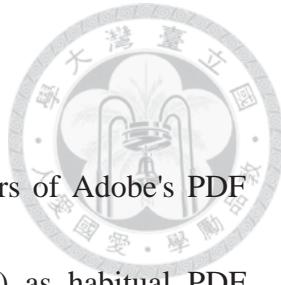
the latest two versions (version 11.0 and version 10.0) of Adobe PDF reader. In addition,

67.6% of the respondents had used Adobe PDF reader for more than 3 years, and 47.9%

of our respondents used it 1-3 times a week averagely.

Table 3. Sample Demographic

Measurement	Item	Percentage (Reader N=109)	Percentage (Writer N=33)
Gender	Male	64.8	72.7
	Female	35.2	27.3
Age	Under 12	0.0	0.0
	13-19	12.7	0.0
	20-34	84.5	90.9
	35-49	2.8	9.1
	Over 50	0.0	0.0
Occupation	Military, Civil and Teaching Staff	8.5	18.2
	Service industry	5.6	4.6
	Financial sector	4.2	4.6
	IT industry	5.6	0
	Manufacturing industry	4.2	4.6
	Student	69	59
	Other	2.8	9
Version	Adobe XI (11.0) or newer version	31	22.7
	Adobe X (10.0)	38	36.4
	Adobe 9.0	21.1	22.7
	Adobe 8.0 or older version	9.9	18.2
Using time	Less than 6 months	7	9
	More than 6 months but less than 1 year	9.9	22.7
	1-3 years	15.5	36.4
	3 years or more	67.6	31.8
Average using frequency per week	Less than once a week	19.7	27.2
	1- 3 times a week	47.9	36.4
	4- 6 times a week	21.1	13.6
	Everyday	11.3	22.7

Another purpose of the study is to investigate the affecting factors of consumer satisfaction and behavior regarding the "distance between the two sides" in two-sided networks. We compared the average income, average willingness to pay (WTP) and average number of demanded functions of both sides respectively. Table 4 shows the gap between the two sides. For annual income, the average result of writer side is 2.1 times higher than that of reader side. Regarding willingness to pay, the average result of writer side is 1.9 times higher than that of reader side for Adobe Reader, and 2.4 times higher than that of reader side for Adobe Writer. Respecting the number of demanded functions, the writer side demanded 1.8 times greater than the reader side averagely.

Table 4. Comparison between Readers and Writers

Measurement	Reader	Writer	Gap
Average annual income (TWD)	145,838	306,454	160,616 (2.1 times)
Average WTP for Adobe Reader (TWD)	461	886	425 (1.9 times)
Average WTP for Adobe Writer (TWD)	644	1,523	879 (2.4 times)
Average number of demanded functions (item)	2.67	4.82	2.15 (1.8 times)

3.5 Reliability and Validity

To develop the scales for each construct in our model, we used the valid measures from previous studies and adapted them to fit our research context. After designing the questionnaire draft, a pretest was performed. According to the respondents' feedback, we revised the vague expressions to ensure the accuracy of the questionnaire. We used SmartPLS to conduct factor cross-loading analysis. It is suggested that the factor loadings for each construct should be greater than 0.5, and most of them should approach or exceed the 0.7 level (Hair, Black et al. 2009), as shown in Table 5, there is no cross-loading problem in our study. Therefore, all of our participants could understand each question clearly, which ensured the content validity.

Table 5. Cross Factor Loadings

	Exp	**Function**	**Loyalty**	**Monopoly**	**Satisfaction**
rExp_1	0.856	0.455	0.364	0.072	0.477
rExp_2	0.834	0.457	0.304	0.160	0.363
rExp_3	0.704	0.374	0.245	0.301	0.209
rExp_4	0.687	0.364	0.232	0.023	0.214
rExp_5	0.668	0.410	0.229	0.133	0.184
rFunction_1	0.418	0.820	0.435	0.331	0.448
rFunction_2	0.469	0.843	0.419	0.043	0.435
rFunction_3	0.428	0.720	0.294	0.143	0.488
rLoyalty_1	0.198	0.335	0.711	0.417	0.477
rLoyalty_2	0.297	0.192	0.551	0.099	0.177
rLoyalty_3	0.334	0.450	0.926	0.495	0.465
rLoyalty_4	0.402	0.424	0.948	0.463	0.464
rMonopoly_1	0.032	0.010	0.331	0.780	0.177
rMonopoly_2	0.055	0.101	0.405	0.724	0.173
rMonopoly_3	0.171	0.178	0.411	0.911	0.316
rMonopoly_4	0.239	0.385	0.488	0.878	0.409
rMonopoly_5	0.177	0.185	0.457	0.877	0.278
rSatisfaction_1	0.417	0.412	0.480	0.344	1.000

Note: rExp: user experience; rFunction: software function; rLoyalty: customer loyalty;
rMonopoly: degree of monopoly; rSatisfaction: reader satisfaction
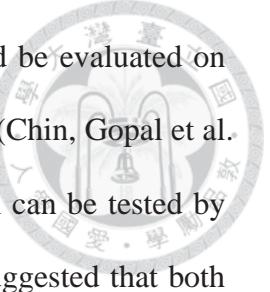
For confirmatory factor analysis, the measurement model should be evaluated on the criteria of reliability, convergent validity and discriminate validity (Chin, Gopal et al. 1997). Reliability is the internal consistency of each construct, which can be tested by the composite reliability, Cronbach's alpha and factor loading. It is suggested that both Cronbach's alpha and composite reliability (CR) should be greater than 0.7, and each factor loading should be higher than 0.5, with most of them approaching or exceeding the 0.7 level (Hair, Black et al. 2009). As shown in Table 6, the reliability coefficients of all measures were satisfactory, all Cronbach's alpha and CR exceed 0.7, and all factor loadings are higher than 0.5, ensuring the internal consistency of the measurements in our study.

When multiple indicators are used to measure one construct, convergent validity should be validated. It refers to the degree to which items within a given construct should be related, and it can be examined by factor loading, item-total correlation (ITC) and average variance extracted (AVE) (Fornell and Larcker 1981). For satisfactory convergent validity, ITC should not be less than 0.3, AVE should be above 0.5, and factor loading is acceptable when it is greater than 0.5 (Nunnally Jum and Bernstein Ira 1978). Based on the result in Table 6, our measurement items have the proper convergent validity.

Discriminate validity refers to the extent to which two constructs are distinct. To achieve the discriminate validity, the square of AVE of each construct should be higher than the inter-construct correlation coefficient (Fornell and Larcker 1981). As shown in Table 7, all the diagonal values are greater than the inter-construct correlations, which indicates the measurements in our study achieve required discriminate validity.

Table 6. The Result of Factor Analysis

Constructs	Items	Factor Loadings	ITC
User experience Cronbach's a = 0.814 CR = 0.867 AVE = 0.553	1. I think the performance of Adobe Reader is stable.	0.856	0.646
	2. I think Adobe Reader does what it claims.	0.834	0.648
	3. The product information on the Adobe website is very detailed, and I can easily get the information I need.	0.704	0.545
	4. Adobe's professional technical services make me feel at ease.	0.687	0.611
	5. Adobe can quickly provide services to meet my needs.	0.668	0.579
Software function Cronbach's α = 0.701 CR = 0.838 AVE = 0.634	1. The functions of Adobe Reader meet my needs.	0.820	0.452
	2. Adobe Reader is easy to use.	0.843	0.664
	3. The speed performance of Adobe Reader is good.	0.720	0.468
Customer loyalty Cronbach's α = 0.816 CR = 0.873 AVE = 0.641	1. I will keep using Adobe Reader.	0.711	0.646
	2. I will upgrade to the latest version if Adobe Reader launches a new version.	0.551	0.648
	3. I will recommend others to use Adobe Reader.	0.926	0.545
	4. I will recommend Adobe Reader to my friends when they ask me for advice.	0.948	0.611
Degree of monopoly Cronbach's α = 0.891 CR = 0.921	1. I feel that I only have very few choices of other PDF software except Adobe Reader.	0.780	0.706
	2. It will cause inconvenience if I don't use Adobe Reader in my daily work.	0.724	0.602
	3. I can't easily switch to other companies' products from Adobe Reader.	0.911	0.839
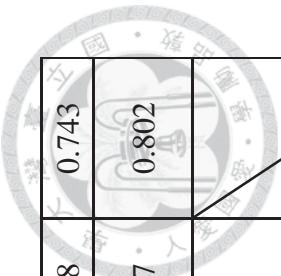
AVE = 0.701	4. The longer I use Adobe Reader, the harder I can switch to other companies' products.	0.878	0.743
	5. I think there is no other product one such as Adobe Reader that can fulfill my needs in the PDF market at present.	0.877	0.802
Reader satisfaction Cronbach's α = No (only one item) CR = 1.000 AVE = 1.000	1. Overall, I am very satisfied with Adobe Reader.	1.000	

Table 7. Descriptive Statistics and Correlations

Variable	Mean	Std. Dev.	[a]M3	[b]M4	[c]Correlation Matrix				
					Customer loyalty	Degree of monopoly	Reader satisfaction	Software function	User experience
Customer loyalty	3.880	0.722	-0.201	0.303	0.801				
Degree of monopoly	3.389	0.811	-0.102	0.172	0.511	0.836			
Reader satisfaction	3.680	0.667	-1.561	3.466	0.680	0.346	1.000		
Software function	3.798	0.618	-0.454	1.661	0.540	0.242	0.712	0.796	
User experience	3.682	0.542	-0.057	0.029	0.433	0.174	0.473	0.655	0.744

Note: [a] M3: Skewedness; [b] M4: Kurtosis; [c] The diagonal line of correlation matrix represents the square root of AVE, which should be greater than the inter-construct correlations

4. Results and Discussions

4.1 Date Analysis

We used two steps to test if there is a significant loop in our research model by Model 1 and 2. Model 1 tested Hypotheses 1, 2, 3 and 4; Model 2 tested Hypothesis 5. Hypothesis testing was conducted by partial least squares regression analysis with SmartPLS software. To test if each hypothesis was supported, we evaluated the t-statistic for the standardized path coefficients, and the explanatory power of the structural model was assessed by the R^2 value. All the path coefficients and explained variances for the model are shown in Figure 6.
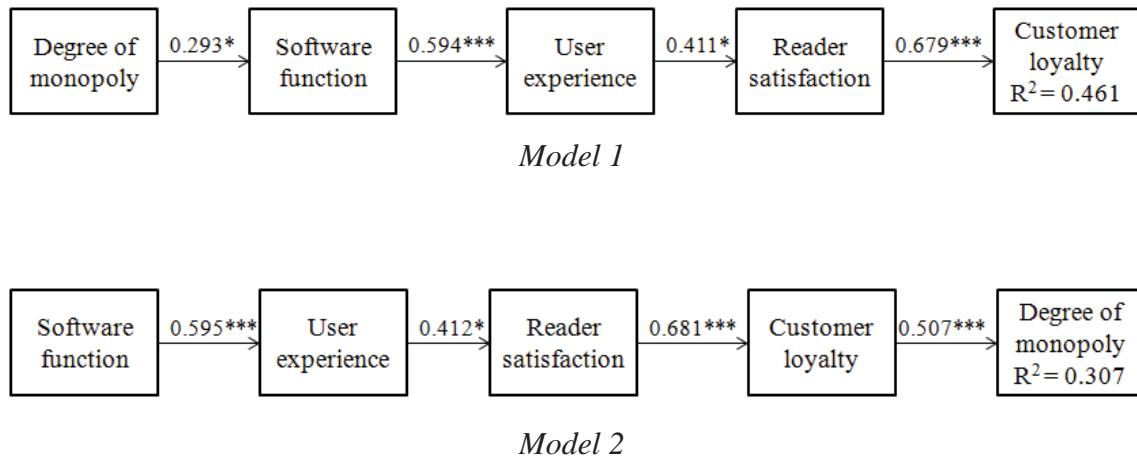

Model 1

*Model 2*

Figure 6. Structural Model and Path Coefficient
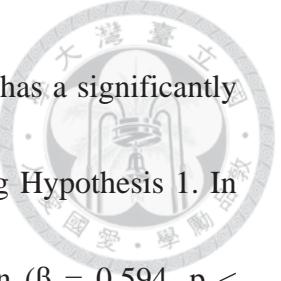
As indicated by path loadings in Model 1, degree of monopoly has a significantly positive effect on software function ($\beta = 0.293$ $p < 0.05$), supporting Hypothesis 1. In addition, it is consistent with our assumption that software function ($\beta = 0.594$, $p < 0.001$) has a positive effect on user experience, and user experience ($\beta = 0.411$, $p < 0.05$) also has a positive effect on reader satisfaction, supporting Hypotheses 3 and 4. Moreover, the path from reader satisfaction ($\beta = 0.679$, $p < 0.001$) to customer loyalty is significant and positive. This result confirms our theoretical expectation and supports for Hypothesis 4.

In regards to Model 2, customer loyalty ($\beta = 0.507$, $p < 0.001$) shows a significant and positive effect on degree of monopoly, thus Hypothesis 5 is supported. The result indicates the existence of the loop in our research model.

Finally, the reader satisfaction explains 46.1% of the variance in customer loyalty, and customer loyalty explain 30.7% of the variance in degree of monopoly. All the hypotheses and the results of the structural model assessment are shown in Table 8.

Table 8. The Result of Structural Model

Hypothesis	Standardized path coefficient	T-statistic	Result
H1: In a two-sided PDF market, the degree of monopoly positively influences the software function.	0.293*	1.975	Support
H2: In a two-sided PDF market, the software function positively influences the user experience.	0.594***	5.059	Support
H3: In a two-sided PDF market, the user experience positively influences the reader satisfaction.	0.411*	2.279	Support
H4: In a two-sided PDF market, the reader satisfaction positively influences the customer loyalty.	0.679***	9.642	Support
H5: In a two-sided PDF market, the customer loyalty positively influences the degree of monopoly.	0.507***	4.721	Support

4.2 Discussion
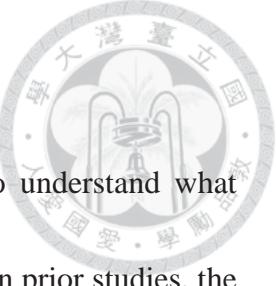
This study introduced a model from customer's perspective to understand what factors lead to customer loyalty in a monopolized two-sided market. In prior studies, the degree of monopoly in two-sided market enhances the network externality and also creates standardization (Farrel and Saloner 1985, L.Katz and Shapiro 1985, L.Katz and Shapiro 1986). We can see that degree of monopoly of Adobe has a significantly positive effect on its software function, which indicates the more the degree of monopoly, the greater function Adobe's PDF software has. And this all the way affects the users' experience, satisfaction and their loyalty.

The new finding in our study indicates that customer loyalty also significantly affects degree of monopoly. This result causes a loop, therefore, every single variable in this loop plays an important role. They determine the loop would turn into a virtuous cycle or a vicious cycle. The company counts, the product counts, and the users counts. As a result, even if the company is more monopolized and keeps launching new versions of products, once the new functions are not what users really need, the users would feel bad about their using experience, and the virtuous loop would be broken.

According to the evidences, although a monopolized firm in two-sided market

could attract more users from both sides, the users still have gripes about their

experience before, during and after using the products. Therefore, if the new product

does not make the user experience better, it is a warning sign for the firm that it may fall

into a vicious cycle. For the subsidized users, they enjoy the functionality and the

convenience of unified format for free, yet it is not excessive upgrades that make the

users being loyal, but the good using experiences.

5. Conclusions and Implications

Previous researches demonstrated that the network effects in two-sided markets are the main influences of platform user base, and consequently came out the pricing strategy for monopolized two-sided platform. Yet we re-examined the popular studies from a new angle, which is from customer's perspective. The objective of this research is to find out how the degree of monopoly affects customer loyalty in two-sided networks, and we found that the relation between them is statistical significance.

For implications, the firms in multi-sided markets should respond to the customer voices and complaints, otherwise, they will lose their loyalty and good impression. In our focal case, Adobe, it should be more customer-centric while designing and selling products, to eliminate the gap between developing team and customer expectation. The firm can not intentionally raise the prices, and let customer continue to upgrading and buying new version products even before they are familiar with the older version. Recently, Adobe has launched Creative Cloud that combines its main products with online subscription, and announced that they will stop launching new Creative Suite edition in the future. This strategy change can be regarded as supporting evidence to our research.
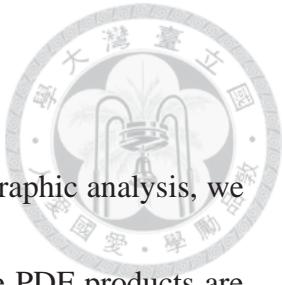
There are still limitations for this study, according to the demographic analysis, we can see that some samples may not be our main targets since Adobe PDF products are not their habitual choices, therefore, our measurement of distance is limited. For future study, researchers could collect more samples focus on real Adobe users, and continue developing a tractable measurement of the "distance" of two sides based on this study. To further display the relationships between all stakeholders, we provide a concept model (Appendix C) which uses reinforcing loops and balancing loops to show the distinct influence to each side's satisfaction affected by the degree of monopoly. We believe the distance of two side is the key factor to alter the monopolized two-sided market, which may have deep influence for future research in multi-sided markets.

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Appendix A - Price Table of PDF Writers

Table a. The Price Table of Adobe

Adobe Writer		Full	Upgrade
Standard		$299	$139
Pro		$449	$199
Suite		$1,199	$799
Student & Teacher Edition		$119	
Subscription fee per month	One-year	$19.99	
	Month-to-month	$29.99	

Note: After launching the Creative Cloud in the latest CS version on April 2012, consumers can now use online subscription of the software. But the subscription fee is still very high compared to the original price.

Table b. The Price Comparison between Adobe and Competitor's PDF software

Foxit Phantom PDF		Adobe Acrobat		
			Full	Upgrade
Express	$24.65			
Standard	$80.75	Standard	$299	$139
Business	$126.65	Pro	$449	$199
Business Desktop Bundle	$135.15	Acrobat X Suite	$1,199	$799

Note: Compare to Adobe's main competitors in PDF market, Foxit, Adobe's price is much higher, while their functions are almost the same.

Appendix B - Consumer Behavior and Purchase Habit

Which release of Adobe's products do you use?
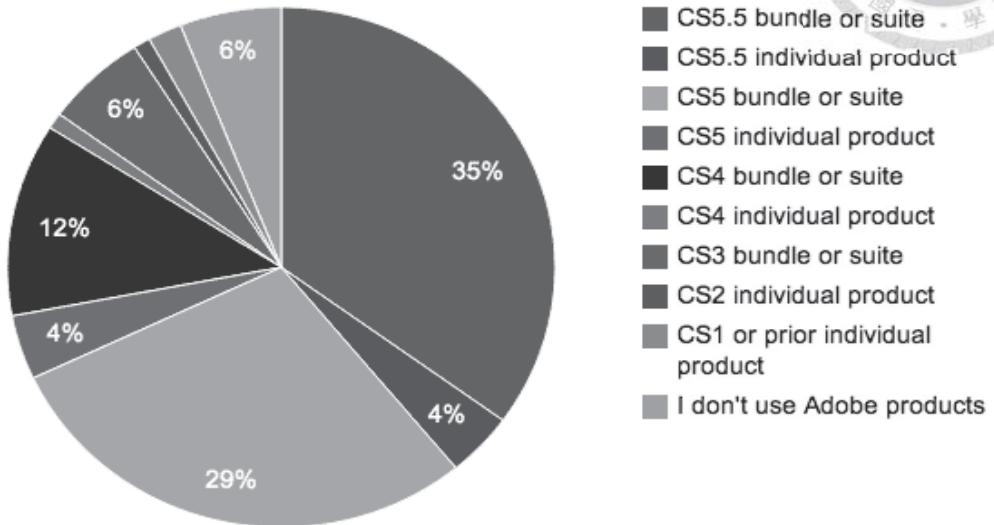
Most people use suites of Adobe software, not individual products.
(Credit: CNET/Jefferies)

Note: This pie chart shows the consumer behavior towards Adobe's products. Notice that no matter which version it is, most people use Adobe's Creative Suite (CS) instead of its individual products. After adding up the proportion of the bundle part, here we see 82% of the consumers are willing to spend more on purchasing the whole bundle (many of the products in the bundle may even never be used), and only less than 12% of them are using individual products. The chart also shows that over 72% of the people updated their software to the latest two versions, this distribution could have been the result of Adobe's bundle strategy as well as its never ended, high-frequency version update.

Appendix C - Concept Model for Future Study
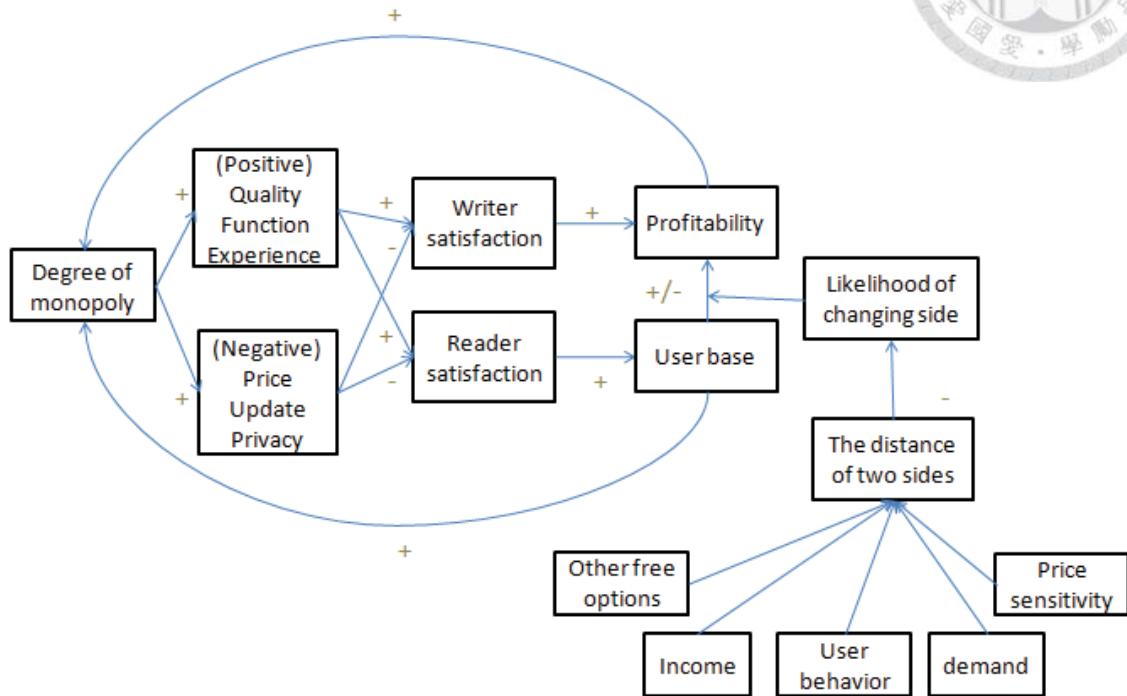
The concept model is mainly divided into two parts: (1) The part of how monopoly affects consumer satisfaction and the consequently profitability changes of the company. We believe the profitability influences the degree of monopoly, so it will ultimately form a loop; (2) The other part is the variables from consumer side which decide the "distance" between two user groups, writer and reader, will affect the likelihood of users change their side, which ultimately moderates the profitability of the company.

Appendix D - Questionnaire for Readers

Dear respondents,

Thank you for your time. This is an academic questionnaire. The goal of this survey is to research the consumer usage and experience of Adobe Writer and Adobe Reader, your help would be a great contribution to this research.

The survey is taken anonymously. All collected data will be kept confidential and be used for academic research only. Your feedback is highly appreciated.

Researcher: Heng Yang
Advisor: Ming-Hui Huang, PhD

Department of Information Management
National Taiwan University
R00725014@ntu.edu.tw

Please read this instruction before answering the questions:

Adobe Writer (PDF editor) and Adobe Reader (PDF viewer) are widely used as a method of presenting digitized information with a fixed layout similar to a paper publication.

●**Adobe Reader** enables users to view, add comments and print PDF files. It can be downloaded for free from Adobe's website.

●Adobe Acrobat, we call it **Adobe Writer** in this survey, is an application software to view, create, edit, print, manage, and protect files in PDF. The following are the prices of Adobe Writer in different editions (in US dollars).

Adobe Writer		
	Full	Upgrade
Standard	$299	$139
Pro	$449	$199
Suite	$1,199	$799
Student & Teacher Edition	$119	

| Subscription | One-year | $19.99 |
| | Month-to-month | $29.99 |

1. Which Adobe PDF software do you use?

   □ I only use Adobe Reader

   □ I also use Adobe Writer

   □ Neither of them

2. What is your gender?

   □Male

   □Female

3. Which category describes your age?

   □12 and under

   □13-19

   □20-34

   □35-49

   □50 and over

4. What is the highest level of education you received?

   □High school or less

   □Trade of vocational school

   □Undergraduate college degree

   □Graduate degree

5. What is your occupation?

   □Military, Civil and Teaching Staff

   □Service industry

   □Financial sector

   □IT industry

   □Manufacturing industry

   □Student

   □ Other

6. Your personal annual income is (in US dollars)

   □$10,000 or less

   □$10,001 - $30,000

   □$30,001 - $50,000

   □$50,001 - $70,000

   □$70,001 or more

7. Regarding to the previous question, your personal annual income is

8.	How much do you spend on software on average every year? (in US dollars) □$100 or less □$101 - $500 □$501 - $1,000 □$1001 or more
9.	Regarding to the previous question, the amount is _____
10.	Your willingness to pay for Adobe Reader is (in US dollars) □0 - $100 □$101 - $400 □$401 - $700 □$701 - $1,000 □$1,001 or more
11.	Regarding to the previous question, the amount is _____
12.	Your willingness to pay for Adobe Writer is (in US dollars) □0 - $100 □$101 - $400 □$401 - $700 □$701 - $1,000 □$1,001 or more
13.	Regarding to the previous question, the amount is _____
14.	Is your willingness to pay for Adobe Writer higher or lower than the price below? (For example, you want to buy the professional edition, then compare the price with the corresponding column)

Adobe Writer		Full	Upgrade
Standard		$299	$139
Pro		$449	$199
Suite		$1,199	$799
Student & Teacher Edition		$119	
Subscription	One-year	$19.99	
	Month-to-month	$29.99	

□Higher

	□Lower
15.	The latest Adobe Reader version you are using: □Adobe Reader XI (11.0) or newer version □Adobe Reader X (10.0) □Adobe Reader 9.0 □Adobe Reader 8.0 or older version
16.	How long have you used Adobe Reader? □Less than 6 months □More than 6 months but less than 1 year □1-3 years □3 years or more
17.	What are your demands when you use Adobe Reader? (Multiple answers) □View PDF files □Add comments □Copy the content □Search the content □Print PDF file □Other
18.	I am using/have used other company's products that have similar functions as Adobe Reader (which can view, add comments and print PDF files) □Yes □No
19.	How often do you use Adobe Reader? □Less than once a week □1- 3 times a week □4- 6 times a week □Everyday

The following questions are for valuing your experience and perception of Adobe Reader.

5 - Strongly agree,

4 - Somewhat agree,

3 - Neither agree nor disagree,

2 - Somewhat disagree,

1 - Strongly disagree

20.
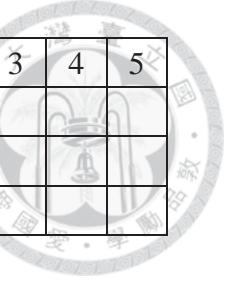
	1	2	3	4	5
I think the quality of Adobe Reader is good.					
I think the performance of Adobe Reader is stable.					
I think Adobe Reader does what it claims.					

21.

	1	2	3	4	5
The functions of Adobe Reader meet my needs.					
Adobe Reader is easy to use.					
The speed performance of Adobe Reader is good.					
I feel Adobe Reader consumes much computer system resources when it runs.					

22.

	1	2	3	4	5
The product information on the Adobe website is very detailed, and I can easily get the information I need.					
My installation and my first use experience is good.					
Adobe's professional technical services make me feel at ease.					
Adobe can quickly provide services to meet my needs.					

23.

	1	2	3	4	5
I will keep using Adobe Reader.					
I will upgrade to the latest version if Adobe Reader launches a new version.					
I will recommend others to use Adobe Reader.					
I will recommend Adobe Reader to my friends when they ask me for advice.					

24.

	1	2	3	4	5
I feel reasonable about the update frequency of Adobe Reader.					
I prefer Adobe Reader keeps updating.					
I think the restart process during updates interrupts me.					
I feel annoyed that Adobe Reader requires to restart my computer to finish the update every time.					

	1	2	3	4	5
I can't feel obvious improvement after every update of Adobe Reader.					

25.

	1	2	3	4	5
Overall, I am very satisfied with Adobe Reader.					

This section is for surveying your choices of other PDF reader software

5 - Strongly agree,

4 - Somewhat agree,

3 - Neither agree nor disagree,

2 - Somewhat disagree,

1 - Strongly disagree

26.

	1	2	3	4	5
I feel that I only have very few choices of other PDF software except Adobe Reader.					
It will cause inconvenience if I don't use Adobe Reader in my daily work.					
I can't easily switch to other companies' products from Adobe Reader.					
The longer I use Adobe Reader, the harder I can switch to other companies' products.					
I think there is no other product one such as Adobe Reader that can fulfill my needs in the PDF market at present.					
I have at least one other choice other than Adobe Reader to do the similar tasks for me.					

This section is to understand the interaction between you and the users of Adobe Writer.

5 - Strongly agree,

4 - Somewhat agree,

3 - Neither agree nor disagree,

2 - Somewhat disagree,

1 - Strongly disagree
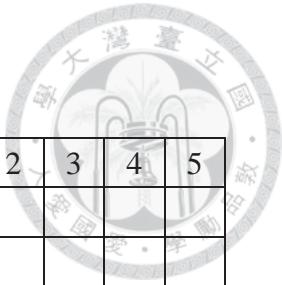
27.

	1	2	3	4	5
I will convert from Adobe Reader user to Adobe Writer user.					
I would very likely buy Adobe Writer in the future.					
Unless the price goes much lower, I won't purchase Adobe Writer.					

Appendix E - Questionnaire for Writers

Dear respondents,

Thank you for your time. This is an academic questionnaire. The goal of this survey is to research the consumer usage and experience of Adobe Writer and Adobe Reader, your help would be a great contribution to this research.

The survey is taken anonymously. All collected data will be kept confidential and be used for academic research only. Your feedback is highly appreciated.

Researcher: Heng Yang

Advisor: Ming-Hui Huang, PhD

Department of Information Management

National Taiwan University

R00725014@ntu.edu.tw

Please read this instruction before answering the questions:

Adobe Writer (PDF editor) and Adobe Reader (PDF viewer) are widely used as a method of presenting digitized information with a fixed layout similar to a paper publication.

●**Adobe Reader** enables users to view, add comments and print PDF files. It can be downloaded for free from Adobe's website.

●Adobe Acrobat, we call it **Adobe Writer** in this survey, is an application software to view, create, edit, print, manage, and protect files in PDF. The following are the prices of Adobe Writer in different editions (in US dollars).

Adobe Writer			
		Full	Upgrade
Standard		$299	$139
Pro		$449	$199
Suite		$1,199	$799
Student & Teacher Edition		$119	
Subscription	**One-year**	$19.99	

	Month-to-month	$29.99

1.	Which Adobe PDF software do you use? □ I only use Adobe Reader □ I also use Adobe Writer □ Neither of them
2.	What is your gender? □Male □Female
3.	Which category describes your age? □12 and under □13-19 □20-34 □35-49 □50 and over
4.	What is the highest level of education you received? □High school or less □Trade of vocational school □Undergraduate college degree □Graduate degree
5.	What is your occupation? □Military, Civil and Teaching Staff □Service industry □Financial sector □IT industry □Manufacturing industry □Student □ Other
6.	Your personal annual income is (in US dollars) □$10,000 or less □$10,001 - $30,000 □$30,001 - $50,000 □$50,001 - $70,000 □$70,001 or more
7.	Regarding to the previous question, your personal annual income is _____

8. How much do you spend on software on average every year? (in US dollars) □$100 or less □$101 - $500 □$501 - $1,000 □$1001 or more
9. Regarding to the previous question, the amount is _____
10. Your willingness to pay for Adobe Reader is (in US dollars) □0 - $100 □$101 - $400 □$401 - $700 □$701 - $1,000 □$1,001 or more
11. Regarding to the previous question, the amount is _____
12. Your willingness to pay for Adobe Writer is (in US dollars) □0 - $100 □$101 - $400 □$401 - $700 □$701 - $1,000 □$1,001 or more
13. Regarding to the previous question, the amount is _____
14. Is your willingness to pay for the Adobe Writer higher or lower than the price below? (For example, you want to buy the professional edition, then compare the price with the corresponding column)

<table>
<tr><td colspan="4" align="center">Adobe Writer</td></tr>
<tr><td></td><td></td><td align="center">Full</td><td align="center">Upgrade</td></tr>
<tr><td colspan="2" align="center">Standard</td><td align="center">$299</td><td align="center">$139</td></tr>
<tr><td colspan="2" align="center">Pro</td><td align="center">$449</td><td align="center">$199</td></tr>
<tr><td colspan="2" align="center">Suite</td><td align="center">$1,199</td><td align="center">$799</td></tr>
<tr><td colspan="2" align="center">Student & Teacher Edition</td><td colspan="2" align="center">$119</td></tr>
<tr><td rowspan="2" align="center">Subscription</td><td align="center">One-year</td><td colspan="2" align="center">$19.99</td></tr>
<tr><td align="center">Month-to-month</td><td colspan="2" align="center">$29.99</td></tr>
</table>

□Higher

	□Lower
15.	The latest Adobe Writer version you are using: □Adobe Writer XI (11.0) or newer version □Adobe Writer X (10.0) □Adobe Writer 9.0 □Adobe Writer 8.0 or older version
16.	How long have you used Adobe Writer? □Less than 6 months □More than 6 months but less than 1 year □1-3 years □3 years or more
17.	What are your demands when you use Adobe Writer? (Multiple answers) □View PDF file □Add comments □Copy the content □Search the content □Convert images of text to editable text (OCR, optical character recognition) □Print PDF file □Create PDF file □Edit PDF file □Security setting of PDF file □Other
18.	I am using/have used other company's products that have similar functions as Adobe Writer (which can view, create, edit, print, manage, and protect PDF files) □Yes □No
19.	How often do you use Adobe Writer? □Less than once a week □1- 3 times a week □4- 6 times a week □Everyday

The following questions are for valuing your experience and perception of Adobe Writer.

5 - Strongly agree,

4 - Somewhat agree,

3 - Neither agree nor disagree,

2 - Somewhat disagree,

1 - Strongly disagree

20.

	1	2	3	4	5
I think the quality of Adobe Writer is good.					
I think the performance of Adobe Writer is stable.					
I think Adobe Writer does what it claims.					

21.

	1	2	3	4	5
The functions of Adobe Writer meet my needs.					
Adobe Writer is easy to use.					
The speed performance of Adobe Writer is good.					
I feel Adobe Writer consumes much computer system resources when it runs.					

22.

	1	2	3	4	5
I would purchase Adobe Writer again.					
I will keep using Adobe Writer.					
I will upgrade to the latest version if Adobe Writer launches a new version.					
I will recommend others to use Adobe Writer.					
I will recommend Adobe Writer to my friends when they ask me for advice.					

23.

	1	2	3	4	5
It is unreasonable that Adobe sells its products much more expensive in other countries than in America.					
The price of Adobe Writer is reasonable.					
Adobe Writer is worth the purchase price.					

24.

	1	2	3	4	5
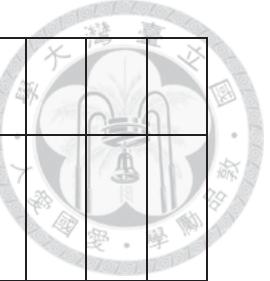
The product information on the Adobe website is very detailed, and I can easily get the information I need.					
It is unreasonable that Adobe requires very detailed personal data of the user in the educational version. (ex. Requires teacher's staff paycheck stub, student's transcript)					
My installation and my first use experience is good.					
Adobe's professional technical services make me feel at ease.					
Adobe can quickly provide services to meet my needs.					

25.

	1	2	3	4	5
I feel reasonable about the update frequency of Adobe Reader.					
I prefer Adobe Reader keeps updating.					
I think the restart process during updates interrupts me.					
I feel annoyed that Adobe Reader requires to restart my computer to finish the update every time.					
I can't feel obvious improvement after every update of Adobe Writer.					

26.

	1	2	3	4	5
Overall, I am very satisfied with Adobe Writer					

This section is for surveying your choices of other PDF Writer software

5 - Strongly agree,

4 - Somewhat agree,

3 - Neither agree nor disagree,

2 - Somewhat disagree,

1 - Strongly disagree

27.

	1	2	3	4	5
I feel that I only have very few choices of other PDF software except Adobe Writer.					
It will cause inconvenience if I don't use Adobe Writer in my daily work.					
I can't easily switch to other companies' products from Adobe					
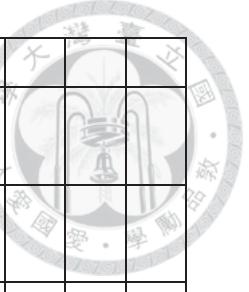
Writer.					
The longer I use Adobe Writer, the harder I can switch to other companies' products.					
I think there is no other product one such as Adobe Writer that can fulfill my needs in the PDF market at present.					
I have at least one other choice other than Adobe Writer to do the similar tasks for me.					

This section is to understand the interaction between you and the users of Adobe Reader.

5 - Strongly agree,

4 - Somewhat agree,

3 - Neither agree nor disagree,

2 - Somewhat disagree,

1 - Strongly disagree

28.

	1	2	3	4	5
I would very likely switch back from Adobe Writer user to only Adobe Reader user in the future.					
I would very likely switch to other companies' PDF editors.					