A Pricing Framework for Software-as-a-Service

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***Abstract*—As an emerging business model, software-as-a-service (SaaS) has proliferated over the past decade and there are signs to suggest that this growth is likely to continue or even accelerate in the near future. By hosting single-versioned software coupled with supplementary delivery and maintenance services, SaaS vendors can effectively differentiate their product offerings from that of traditional on-premise software (TOPS). This paper highlights discrepancies in licensing practices between SaaS and TOPS before developing a three-level pricing framework that presents a complete inventory of licensing options for the former. Next, our proposed framework is validated based on content analysis of licensing strategies adopted by 353 SaaS vendors. In doing so, we identify trends that permeate licensing strategies in the SaaS market. As such, our proposed framework not only offers a comprehensive overview of pricing options that are accessible to SaaS vendors, but it also aids SaaS vendors in constructing lucrative software licenses by bringing forth pricing options which may have been neglected otherwise.**

Keywords—software as a service; pricing framweork; software licence; price discrimination

I. INTRODUCTION

Software-as-a-Service (SaaS), "software deployed as a hosted service and accessed over the Internet," is an emerging business model that is expected to grow rapidly [1]. According to a study by Gartner, the global SaaS market is expected to reach 12.1 billion USD by 2014, reflecting a compound annual growth rate of 26%. This rapid growth of the SaaS market has had considerable influence on the software market [2].

SaaS differs from traditional off-the-shelf software in three aspects. First, SaaS is outsourced software, meaning that both technology infrastructure and management - hardware, software and professional services - are contracted out to software vendors. Second, SaaS is remotely hosted, meaning that software are deployed as hosted services to be accessed by clients from remote locations [3]. Third, SaaS is single versioned, meaning that there is only one version of software being accessed by every client at any moment in time. The multi-tenant architecture of SaaS benefits both clients and vendors alike. For clients, the consumption of innovation is faster as new capabilities are released simultaneously with each service upgrade. For vendors, the complexities and costs associated with managing and maintaining multiple software versions can be eliminated [4], thereby freeing up resources to focus on functionality enhancements and service innovations.

As an emergent model of software delivery, SaaS poses a challenge to contemporary licensing practices [4]. While most would assume SaaS licenses to be rather straightforward whereby clients are charged through recurring subscription fees on a pay-as-you-go basis, it is not so. For SaaS licenses to be sustainable, software vendors would have to take into account not only the costs of hosting and maintaining the software, but also the costs associated with the provision of supplementary services (e.g., backup and security), which may not be applicable to each and every client. As the SaaS market continues to gain momentum, the issue of sustainable licensing models becomes increasingly pertinent, especially when few studies have managed to shed light on the phenomenon [4].

To this end, this article advances a pricing framework for software licensing of SaaS that incorporates its unique contextual characteristics as highlighted earlier. The pricing framework is then applied to the analysis of contemporary licensing practices of 353 SaaS vendors to glean insights into trends and shortfalls underlying existing licenses. Findings suggest that while existing SaaS licenses are generally value-based and target broad markets, they tend to be superficial in the provision of flexible licensing options within a single market. We conclude the article with recommended measures that can be leveraged by SaaS vendors to improve the sustainability of their licensing practices.

II. SOFTWARE LICENSING: CONCEPT AND CHALLENGES

Traditionally, software license refers to an agreement granting a licensee the rights to utilize packaged software or components of that software [5]. Software licenses typically cover the procedures that allow a licensee to purchase, install and utilize software on a machine or network [6]. In this sense, the revenue model of software vendors comprises three main sources [7]. First, the upfront usage license fee for the 'perpetual' right to utilize the licensed version of the software and this fee could reach upwards of millions of dollars depending on the nature of the software and number of licensed users. Second, the ongoing maintenance fee which is usually based on a separate maintenance agreement and priced as a percentage of the retail price of the licensed software [5]. Third, the service fee for one-off or ongoing services such as software installation, customization, integration and user training.

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The advent of SaaS however presents renewed challenges to contemporary licensing practices. The first challenge stems from clients' expectations for better service quality. Revenue sources for SaaS are different from those of on-premise software in that the 'perpetual' usage license fee is no longer applicable and clients are charged for only what they have utilized, usually on a periodic basis. Additionally, maintenance revenues disappear as well because maintenance activities are now primarily the responsibilities of SaaS vendors. Loss of revenue from up-front and maintenance payments therefore place greater financial pressure on SaaS vendors to secure a constant source of revenue. Yet, given the nature of SaaS as remotely hosted software services, switching is neither expensive nor tedious for clients [8]. To survive and thrive, SaaS vendors are hence compelled to steadily improve service quality and price it accordingly in order to retain a sizeable pool of clients and achieve economies of scale.

The second challenge comes from the diversity of SaaS clients, among which small and medium enterprises have been the most aggressive adopters. Likewise, large corporations are equally attracted to the idea of acquiring software services on demand [9]. Moreover, diversities are also found in the industries within which SaaS clients are situated. Such diversity translates to conflicting functional requirements and the need for SaaS vendors to tailor licenses to match these firm-specific requirements.

The third challenge resides in clients' varied usage of software services. Whereas some clients may exhibit low-breadth but high-depth usage (i.e., low frequency of service usage but complicated software modules required), others may register the opposite usage pattern (i.e., high frequency of service usage but simple software modules required) or demand access to required services at odd times or from obscure locations. Conceivably, SaaS licenses should consist of pricing options that cater to volatility resulting from the diversified usage patterns of clients.

III. Framing Software Licensing for SaaS

Nowadays, a SaaS vendor typically charges his clients who subscribe hosted services a recurring usage fee [3]. From clients' perspective, such software licenses are greatly simplified for the fact that they only pay for their use of the subscribed software. Conversely, from SaaS vendors' perspective, the creation of sustainable software licenses remains a pertinent and yet elusive goal in the near term.

For SaaS vendors, the most pertinent factors that influence pricing include initial cost, lease period, quality of service (QoS), age of resources and cost of maintenance [10]. In practice, SaaS vendors utilize many pricing options and approaches. For example, a typical pricing approach is to pay once for limitless usage, which is rigid and does not consider many other factors that affect pricing, such as price fairness. Many SaaS vendors employ "pay-per-use fixed pricing," which charges clients according to their overall resource consumption. Pay for resource is another approach, in which clients are charged according to the storage or bandwidth size required. Pay for functionality is another pricing approach, in which clients subscribe for a fixed price per unit or module for a long periods of time.

Though prior categorization of pricing options for SaaS licenses does not exist in extant literature, Lehmann and Buxmann's multi-dimensional pricing framework [4] for off-the-shelf software licenses is relatively comprehensive in its coverage. We therefore adapt and extend Lehmann and Buxmann's framework [4] to SaaS by advancing a three-layered, multi-dimensional pricing framework for SaaS licenses as illustrated in Table 1.

TABLE I. A THREE-LEVEL FRAMEWORK FOR SAAS LICENSING

Level 1: Orientation	Level 2: Category	Level 3: Pricing Component
Value-based	Payment-based	Payment Frequency based. Does pricing refer to multiple frequency of recurring payment (e.g., monthly, annual, etc.)?
		Bulk Payment Discount. Does pricing refer to discount depending on payment frequency?
	Product-based	Function based. Does pricing refer to different functionality configurations?
		Bundling. Does pricing refer to different bundle options of components?
		Organization/Region based. Does pricing refer to different types of organizations or regions?
	Usage-dependent based	Transaction based. Does pricing refer to certain number of transactions processed by software?
		Time based. Does pricing refer to time (e.g., minutes) of accessing SaaS application?
		Performance based. Does pricing refer to business performance metrics reflecting software usage intensity (e.g., number of rooms managed in a hotel management service)?
		Memory/Bandwidth based. Does pricing refer to units of memory (e.g., GB) or bandwidth (e.g., Kpbs) required?
Cost-based	Usage-independent based	Role based. Does pricing refer to a set of pre-defined roles (e.g., authoring user or viewing user in a document management application)?
		User based. Does pricing refer to certain number of users (e.g., named or concurrent users)?
		Location based. Does pricing refer to certain location (e.g., particular computers, computer networks, or other physical devices)?
	Service-based	Helpdesk. Does pricing refer to certain level of helpdesk support?
		Backup. Does pricing refer to backup service (e.g. client's data backup)?
		Security. Does pricing refer to security service (e.g., data encryption)?
		Setup/Training. Does pricing refer to certain level of setup/training support?
		Configuration/Integration. Does pricing refer to application configuration, or customization, or integration support?

Layer 1 of our pricing framework consists of two types of pricing orientations, namely cost-based and value-based. Cost-based pricing implies that price levels of SaaS licenses are defined through cost accounting [4]: price level equals the cost

of delivering software services plus a predetermined profit margin. Cost-based pricing makes sense for SaaS because the remote hosting of software services culminates in significant variable costs for vendors [4]. As such, cost-based pricing is dictated by SaaS vendors rather than clients. Conversely, value-based pricing of SaaS licenses means that price levels are determined through clients' assessment of the business value to be extracted from such software services. Value-based pricing is thus in sharp contrast to cost-based pricing in that it is dictated by clients rather than SaaS vendors.

Level 2 comprises five pricing categories, each consisting of a series of pricing components. Each category is explained as follows.

Payment-based. Monthly subscription fees are the most popular pricing model nowadays [11]. To alleviate financial pressure, software vendors encourage clients to prepay their subscriptions. Sometimes software vendors offer some degree of discount for those bulk payment clients. Payment-based pricing benefits clients by granting them more payment freedom.

Product-based. Software vendors charge clients based on product-related considerations. For instance, a vendor may offer different pricing plans for an application according to certain product-related criteria (e.g., different combinations of functionality) and charge clients differently according to the pricing plan selected by clients. Sometimes, vendors may reconstruct software services into different subgroups (i.e., sub-products) and each is sold separately or several subgroups are bundled up to target niche markets. We ascribe product-based category to value-based orientation because it is the clients who have freedom to choose from the pricing plans or bundle solutions offered by SaaS vendors thus affecting revenues SaaS vendors would receive.

Usage-based. In this category, software vendors charge clients for what they use, typically relating to peak or near-peak levels of usage [4]. Price can be tied to either usage-dependent metrics which reflect the usage intensity of software services, such as transaction quantities performed, memory size used, etc., or usage-independent metrics which has no obvious relation with usage intensity, such as number of users (either named or concurrent users), number of roles, etc. Here we differentiate usage-dependent based category from usage-independent based one, and ascribe usage-dependent based category to value-based orientation, and usage-independent based category to cost-based orientation, respectively. The pricing components within usage-independent based category would tend to benefit SaaS vendors by maximizing licensing fee revenues; meanwhile, since usage intensity of software service is not considered, clients might have to pay for service that may not be used sufficiently to justify the cost. By contrast, pricing components within usage-dependent based category tend to benefit clients by maximizing their business values; clients pay only for what they use, which directly determines the revenues that software vendors receive.

Service-based. In SaaS, some routine services in traditional licensing model still exist, such as helpdesk support, software setup & training, software configuration and integration, etc. [12]; while others such as backup and security, which were once regarded as being part of clients' responsibilities, are offered as purchasable services from SaaS vendors. We ascribe service-based category to cost-based orientation because SaaS vendors could dominate pricing level of such services.

IV. METHODOLOGY

To gain insights into pricing strategies of SaaS vendors, we conducted content analysis to investigate the software licensing practices for SaaS. The pricing data source is obtained through our examination of each SaaS vendor's website according to the vendor list provided by the New Cloud Computing Showplace website (http://www.saas-showplace.com). Based on our knowledge, we tend to believe the SaaS vendor list presented by the prior website is the most comprehensive one. Besides, this website is regarded as the vendor-independent, resource center of industrial best practices in SaaS market. It hence provides us with the confidence with regards to the reliable and validity of our content analysis.

The data collection work was done on September 1, 2012, by then there were 1457 records in the SaaS vendor list records. We further excluded redundant records. Then we excluded records with being most likely invalid website linkages for SaaS vendors that we tried to access these linkages several times at different time and each time we failed. Finally, we excluded records in which vendors did not present detailed price plans. We were eventually left with 353 data points in our final sample. Table 2 presents the descriptive statistics for this sample, which is organized from three aspects, i.e., age of vendors, country of vendors, and industry types, respectively.

TABLE II. DESCRIPTIVE STATISTICS FOR SAAS VENDOR SAMPLE

Variable	Item	%	Item	%
Age of vendors	<10	65	21-30	3
	11-20	30	>30	2
Country of vendors (No. of countries: 26)	USA	63.2	India	2.8
	Canada	7.1	New Zealand	2.0
	UK	6.8	Ireland	1.7
	Australia	5.4	Others	11
Application Types (No. of application types: 45)	CRM	8.8	BPM	4.6
	Collaboration	8.5	Productivity	3.6
	Project Management	6.2	Content Management	3.3
	Marketing	5.3	Business Intelligence	2.9
	Accounting/ Financial	4.9	IT/Application Management	2.8
	Document Management	4.9	Others	44.2
Industry Types (No. of industry types: 32)	Professional Services	9.8	Entertainment/ Media	4.7
	Technology	9.7	Legal	4.5
	Software	9.2	Manufacturing	4.3
	Banking/Financial Services	7.3	Education	4.0
	Healthcare	5.8	Non-Profit	3.4
	Government	4.8	Others`	32.5

We used pricing components at level 3 in Table 1 to collect pricing data by examining each vendor's website from the sample. For each vendor, each pricing component was assigned either zero or one depending on whether it was reflected in the vendor's pricing plan or not. For example, if different configurations of SaaS software are priced differently, then the function-based pricing component will be assigned a one; otherwise, a zero will be assigned. Once the price assignment was completed for every vendor from the sample, we performed cluster analyses on these pricing data in order to gain insights into the SaaS licensing practice. Our cluster analyses were divided into three steps. Step 1 was aimed at level 1, during which the number and percentage composition of clusters were calculated and then breakdowns of cost-based vs. value-based orientations within each cluster were performed. Step 2 and Step 3 were aimed at level 2 and level 3 respectively and similar operations were performed as in Step 1, except that the breakdowns in Step 2 were based on combinatory of pricing categories (i.e., category pairs) whereas the breakdowns in Step 3 were based on combinatory of pricing components (i.e., component pairs) within each category.

V. RESULTS

A. Level 1

We got three clusters of SaaS vendors at this level. Fig. 1 presents the percentage compositions of clusters.

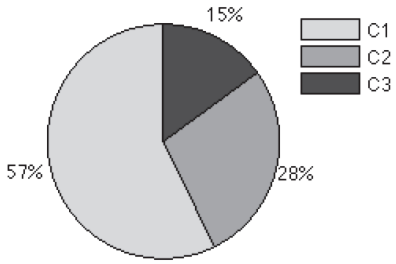

Fig. 1. Percentage compositions of clusters at Level 1

Fig. 2 presents the occurrence percentage of value-based vs. cost-based pricing components within each cluster.

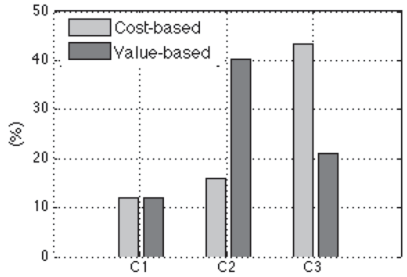

Fig. 2. Occurrences of value-based vs. cost-based components

The largest cluster (C1) makes up 57% of our sample. It represents the percentage of vendors that shows no preference for value-based vs. cost-based orientation; meanwhile, they consider only a few pricing components from either of the two orientations in software pricing. Further statistic showed that in C1 63% vendors considered no more than two components and 91% vendors considered no more than three. We conclude that most SaaS vendors prefer compact licensing models because only a small number of pricing components are utilized in their pricing practices.

Cluster two (C2) makes up 28% of our sample. In this cluster 80% of the vendors used more than 1/3 value-based pricing components and no more than 1/4 cost-based pricing components in software licensing. This result suggests that vendors in C2 attach more importance on value-based rather than cost-based orientation, i.e., they prefer using value-based to cost-based pricing components in their software pricing practices.

Cluster three (C3) makes up 15% of our sample. 87% vendors in C3 considered more than 3/8 cost-based components and no more than 1/3 value-based components in software licensing, which suggests that vendors in C3 attach more importance on cost-based rather than value-based orientation, i.e., they prefer using cost-based to value-based pricing components in their software pricing practices.

B. Level 2

We got three clusters of SaaS vendors at this level. Fig. 3 presents the percentage compositions of clusters.

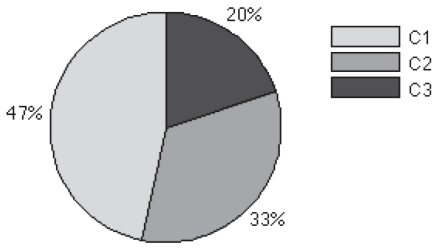

Fig. 3. Percentage compositions of clusters at Level 2

Fig. 4 presents the occurrence percentages of pricing categories within each cluster.

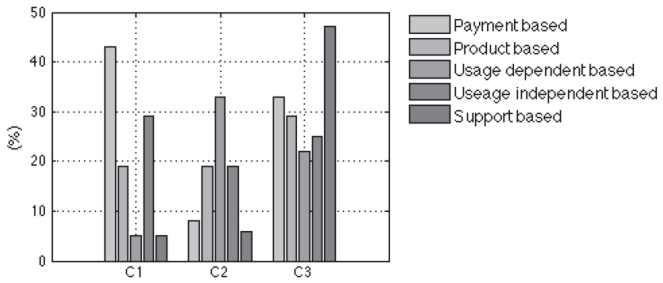

Fig. 4. Occurrences of categories within clusters

Cluster one (C1) that makes up 47% of the sample represent vendors that attached more importance on pricing components from the payment-based and usage-independent based categories than those from other level two categories in software pricing. 55% of the vendors in C1 offered only one type of payment frequency, 41% offered multiple payment frequencies and bulk payment discount simultaneously, and

70% offered one usage-independent based component in software pricing. These results indicate that in general, vendors in C1 may prefer simple pricing methods, which is consistent with our findings at level one. It should be noted that a large number of the vendors are also likely to offer flexible payment options and bulk payment discount incentives because the inclusion of usage-independent based components generally does not incur extra workload.

Vendors in Cluster two (C2) that make up 33% of the sample attach more importance on pricing components from the usage-dependent based category than those from other level 2 categories in software pricing. 97% vendors in C2 offered at least one component from the usage-dependent based category in software pricing. If only considering the categories except the usage-dependent based one, we find that more than 90% vendors in C2 offered no more than one component from each of these categories.

Vendors in Cluster three (C3) that makes up 20% of the sample attach more importance on pricing components from the service-based category than those from others. 91% vendors in C3 used two to three pricing components from the service-based category in software pricing; conversely, more than 77% vendors used zero or one pricing component from categories other than those from the payment-based category. 66% of the vendors offered only a single payment frequency. Vendors in C3 tend to adopt pricing components from the various categories hence indicating their preference for complex software license.

C. Level 3

The findings within each category are summarized as follows.

Payment-based. Our statistics indicated that 67.2% of the vendors used single payment frequency, while 30% used multiple payment frequency options and complementary bulk payment discount incentive. The remaining 2.8% of the vendors used only multiple payment frequency options.

Product-based. In our analysis three clusters emerged in this category. 51% of the sample fall into cluster one (C1), with 38% in cluster two (C2) and 11% in cluster three (C3). For C1, the adoption of each specific pricing component remains below 10%. This could indicate that the vendors in C1 do not seem to attach much emphasis on the product-based pricing components. By contrast, vendors in C2 seem to prefer the function-based pricing component. In this cluster, 100% of the vendors adopted the function-based pricing component compared to a less than 12% adoption rate of the other pricing components. Vendors in C3 seem to prefer the bundle-based pricing component as shown by a 100% adoption rate by vendors as compared to a less than 10% adoption rate of other pricing components.

Usage-dependent based. There are two clusters that emerged in this category. Vendors from cluster one, which make up 75% in the sample, prefer the memory/bandwidth based pricing component that has a 38% adoption rate as compared to a less than 14% adoption rate in the other pricing components. By contrast, vendors from cluster two prefer both transaction-based and performance-based pricing components at 43% and 68% adoption rates respectively. Unsurprisingly the other pricing components have only garnered a less than 14% adoption rate among the vendors in this cluster.

Usage-independent based. Similar to the previous section, there are two clusters that emerged in this category. Vendors from cluster one, making up 67% of our sample, prefer the user-based pricing component in software pricing. The adoption rate of other pricing components remains at only 7% for the vendors in this cluster. For vendors in cluster two, the adoption rate of all pricing components in this Usage-independent based category is also rather low at a rate of less at 7%.

Service-based. There are three clusters in this category. Vendors from cluster one consisting of 69% of our sample, do not seem to prefer pricing components in this category with a adoption rate of less than 12%. Vendors from cluster two making up 22% of our sample prefer the helpdesk-based pricing component with a 100% adoption rate as compared to an adoption rate of only 26% of the other pricing components. The remaining 9% of the vendors make up cluster three. These vendors prefer both setup-based and configuration/integration-based pricing components with a adoption rate of 97% respectively as compared to an adoption rate of less than 42% for other pricing components.

VI. Discussion

Our analysis on SaaS vendors' pricing practices provides some insights into SaaS licensing which are summarized below.

First, results demonstrate that on the one hand SaaS vendors seem to prefer value-based to cost-based orientation in software pricing. Value is what clients really want to pay for. For SaaS vendors, the focus on value-based orientation in software pricing will help them in securing sustainable revenue through the offering of high quality SaaS software. On the other hand, our analysis at level 1 also shows that majority of SaaS vendors nowadays seem to adopt compact pricing strategies within which only a few pricing components are referred, which may indicate the simplification of pricing-related communications between SaaS vendors and clients. However, compact pricing strategies may jeopardize SaaS vendor' profits from clients from niche market because it is often difficult to cover a broader markets.

Second, SaaS vendors tend to target broad markets to gain economy of scale. In SaaS, the deployment of a single version of software serving various clients with diversified requirements eliminates vendors' revenue sources from the provision of software maintenance. The recurring subscription fees from clients substitute vendors' revenue from the traditional up-front payments. To survive and thrive, vendors are supposed to expand clients base continuously in order to leverage on economy of scale. Adopting pricing components from different categories could help in accommodating diverse client preferences. Accordingly, some SaaS vendors included pricing components from different categories in their pricing strategies might demonstrate their endeavor to collect extra revenue by targeting clients with customized requirements.

However, adopting more components in software pricing will result in complicated pricing solutions, which are often translated to high overheads at the vendors' side, such as extra cost for customer care support.

Third, single versioned SaaS software is shared by all clients, which indicates same software will be used in various ways. One classification of the usage of software services comprises two dimensions. One is usage breadth, which indicates the quantity aspect of using software services (or functional points, or modules). The other is usage depth, which indicates the intensity aspect of using software services. In order to meet software licensing challenge from varied usages of clients, usage-based pricing strategies could be attached greater importance by SaaS vendors. Our analysis at level 2 suggests that usage-based pricing strategies were popular among SaaS vendors because usage-based metrics reflect both vendors' costs to deliver services and clients' costs to consume services. The results suggest that usage-independent based pricing components were used by about half of SaaS vendors while usage-dependent based pricing components were used by one-third of SaaS vendors in software pricing. Further statistics indicated that when usage-independent based components were adopted, vendors usually complement them with discount options for pre-pay or bulk-pay subscribers. By contrast, when usage-dependent based components were adopted, vendors seldom offered payment-based discounts because the usage of software services must be measured and billing price aligned with how the clients perceive value. Because the actual usage cannot be determined in advance, it is natural for SaaS vendors to charge the client only for what he uses and not what he thinks he will use.

VII. Conclusion

As an emerging business model, SaaS is attracting more and more attention from both the software industry and the academia. Compared to traditional on-premise software, SaaS has its unique characteristics that give rise to software licensing challenges that SaaS vendors have to face up with, among which, the higher demand for software service quality and the varied usage of the software services. Our investigation showed that software licensing for SaaS is much more complex than initially assumed.

Our work indicates that the licensing practices from current SaaS vendors mainly focus on value-based orientation to deliver more value to clients, targeting at broad markets to leverage economy of scale, and charging clients for what they use by fine-tuning usage-based pricing constructs, etc. Our study indicates that SaaS vendors would adopt pricing components from different categories in software licensing, which reflects their intentions to increase revenues by expanding client base. We argue this strategy is not sustainable for SaaS vendors in the long run because it may cause neglect to the importance of the alignment between license and client's value. We suggest that it is vital for SaaS vendors to target at specialized markets in software licensing. Compared to the generalized market orientation, specialized market orientation implies that the usage variations among clients are less and the accumulation of expertise becomes relatively easy to achieve. This benefits vendors by supporting them to improve the quality of software services and create and deliver value-added client service. Also, specialized market orientation benefits SaaS vendors with extra revenues by allowing them to fine-tune licensing models towards varied usages of software services.

Our research has both research and practice implications. In terms of research, we advanced a novel pricing framework that presents a complete landscape of software licensing for SaaS. This study also highlighted discrepancies in licensing practices between SaaS and traditional on-premise software (e.g., versioning irrelevant), which provides the basis for further exploration of license pricing strategy for SaaS. In terms of practice, this study presented software vendors with state-of-the-art knowledge of the licensing practices for SaaS. Meanwhile, the pricing framework provides a comprehensive categorization of pricing components that can be leveraged by SaaS vendors in constructing software licenses. This framework should also facilitate the identification and consideration of previously overlooked pricing components can then be incorporated into contemporary licenses for SaaS vendors.

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