

# Optimization on Providing Schema of Digital Products with Characteristics of Users and Target Market

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**Abstract.** The decision of providing schema is vital significant for the digital products firms, and firms need to decide whether they should sell the whole (or parts of) functionalities or adopt the subscription strategy (allow the users to pay-per-use when they intend to enjoy these functionalities). The characteristics of users' preference and firms' target market are the important perspective to explore this problem. The current work develops a matrix from the dimension of the characteristics of users' preference and firms' target market and shows that, if the users' preference is stable, the digital products firms are supposed to sell the whole (parts of) functionalities when the firms' target market is the common (specialized) market; however, if the users' preference is variable, the digital products firms are supposed to adopt the subscription strategy for the whole (parts of) functionalities when the firms' target market is the common (specialized) market. Moreover, the current work also provides the cases in reality for each providing schema shown in the matrix. The current work provides support for the digital products firms when they decide the providing schema facing the complex market.

**Keywords:** Providing Schema; digital products; users' preference; target market; operation management.

## 1. Introduction

The suppliers of digital products have been providing their products or services in various schemas. Some vendors, such as mobile applications firms, choose to sell their products, which means the consumers could pay for the products to use them in perpetuity; And others, such as the providers of Software as Service (SaaS), allow the consumers to subscribe and pay per use, i.e., paying the fee according to how long (or how many functionalities) the consumers use. Hence, there are four schemas for proving digital products in the industry: the first one is selling-whole functionalities (*SE-WF*), i.e., the consumers could pay the fee to enjoy all the functionalities permanently; the second one is subscription-whole functionalities (*SU-WF*), i.e., the consumers could pay the fee to enjoy all the functionalities in a certain time; the third one is selling-parts of functionalities (*SE-PF*), i.e., the consumers could pay the fee to enjoy parts of functionalities permanently; and the forth one is subscription- parts of functionalities (*SU-PF*), i.e., the consumers could pay the fee to enjoy parts of functionalities in a certain time. Therefore, the digital products firms have to decide which schema they are supposed to adopt in order to maintain their market share and profits.

In actually fact, the optimal provider schema problem of digital products has been paid much attention in academia, and plenty of researchers have explored this problem. In actually fact, the digital products often consist of modular that service some functionality, hence, Niculescu et al. (2014) argue that the digital products firms are supposed to provide some functionalities for free but charge for some certain functionalities as premium product <sup>[1]</sup>, and some researchers, such as Dou et al. (2013), Cheng et al. (2015), Geng et al. (2019), Lin et al. (2019) and Li et al. (2019) have explored the digital products vendors' decision of providing free samples <sup>[2-6]</sup>. Moreover, some researchers, for instance, Ladas (2022), hold that the digital products suppliers are supposed to adopt pay-per-use strategy which allows the consumers to subscript and pay for some certain modular or the usage in a certain time <sup>[7]</sup>.

Although the researchers have investigated the problem of the optimal decision on the providing schema of digital products, little is known about this problem if taking into account the dimension of features (providing the whole or parts of functionalities) and pricing (selling or subscription). Therefore, the current work analyzes this decision problem facing by the digital products firms from the perspective of the two dimensions. The contribution of the current work is to contribute a further understanding on the providing schema of digital products.

The rest of the current work is organized as follow: Section 2 presents the matrix for investigating the optimal providing schema of digital products, and the matrix is developed from the dimension of the characteristics of users' preference and firms' target market. Section 3 provides the cases in the reality for each schema shown in the matrix. Section 4 concludes the current work.

## 2. Models

For the digital products providers, their decisions are supposed to be made based on the value, but not the cost of the products (Varian, 1997) <sup>[8]</sup>, and in reality, the evaluation of the products' value is affected by the preference of the users, and this value is just the perceived value (HSU et al.,2015;) <sup>[9]</sup>. On the other hand, the situation of target market could also impact the strategies of digital products firms. Therefore, the current work investigates the providing schema of digital products from the perspective of (1) the characteristic of users' preference and (2) the characteristic of target market.

In reality, the users' needs of digital products are often variable. For example, when the users experience the mobile applications such as Twitter and YouTube, they may generate some potential needs that is not discovered before; and the digital products firms are always providing the new versions of their products and services. Hence, the digital products vendors are supposed to taking into account the users' needs when they make decisions. Let's turn to the characteristics of the target markets. In actually fact, the scale of target market would also affect the strategies of digital products firms. For instance, if the target market is specialized, the providers might pay more attention on users' loyalty and adopt the pricing strategy of in-app purchase which is deemed by HSIAO et al. (2016) to be beneficial to improve users' loyalty <sup>[10]</sup>.

Therefore, the current work develops the matrix basing on two dimensions, one is the characteristics of users' needs, and the other is the characteristics of target market. The matrix which is shown in Figure 1 contains four quadrants and each of them represents a providing schema of digital products: if the users' preference is stable, the digital products firms are supposed to sell the whole functionalities (*SE-WF*) or parts of functionalities (*SE-PF*) in the situations of the target market is common or specialized respectively; and if the users' preference is variable, the digital products firms are optimal to allow the users to subscript the whole functionalities (*SU-WF*) or parts of functionalities (*SU-PF*) in the situations of the target market is common or specialized respectively.

		Characteristics of Users' Preference	
		Stable	Variable
Characteristics of Target Markets	Common	Selling-Whole Functionalities	Subscription-Whole Functionalities
	Specialized	Selling-Part Functionalities	Subscription-Part Functionalities

Fig. 1 Schema Matrix for Providing Digital Products

### 3. Analysis

In this section, the current work provides the real cases for each schema illustrated in Figure 1 to demonstrate the feasibility of the matrix. The cases of the providing schema is shown in Figure 2.

		Characteristics of Users' Preference	
		Stable	Variable
Characteristics of Target Markets	Common	Selling-Whole Functionalities ( <b>MS Windows</b> )	Subscription-Whole Functionalities ( <b>ChatGPT</b> )
	Specialized	Selling-Part Functionalities ( <b>SAP</b> )	Subscription-Part Functionalities ( <b>Industrail Internet</b> )

Fig. 2 Cases of Digital Products' Providing Schema

The Case of *SE-WF* is Microsoft Windows. In reality, Microsoft develops the Windows for a common market, and as an operation system product, the users' preference is relatively stable comparing with other digital products; hence, Microsoft charges for Windows, and the users are able to pay for the Windows products to purchase them or upgrade the existing products to the newest version. After paying for the fee, the users could enjoy the whole functionalities of Windows in permanent.

The Case of *SU-WF* is ChatGPT. In fact, ChatGPT is facing the common market and its users are in plenty of fields such as business, education and art. Therefore, the preference of users are quite variable, and then OpenAI charges for ChatGPT in 20\$ per month. The users who has paid for the fee would enjoy the whole functionalities of ChatGPT in a month.

The Case of *SE-PF* is SAP which contains many modulers using in enterprise operation, such as Enterprise Resource Plan (ERP), Supply Chain Management (SCM) and Customer Relationship Management (CRM). Usually, the users of SAP are enterprises, hence, the market of SAP is the typical specialized market and the preference of users in this kind of market is much more stable. Therefore, SAP allows The users to purchase the modulers they need and maintain them permanently.

The Case of *SU-PF* is Industrial Internet. The Industrial Internet Platforms provide industrial software to the industrial firms that link to the plaform, hence, the target market of Industrial Internet Platforms is the specailized market. And in reality, the consumers' needs of the industrial frims are often variable, which makes the needs of those industrial firms are also variable. Therefore, the Industrial Internet Platforms often adopt the providing schema that allow the users, i.e., the industrial firms, pay the fee only for the industrial software they might need or only when they need the software.

### 4. Conclusions

Providing schema is a crucial decision problem facing by the digital products firms. The characteristics of user's preference and the firms' target market are the significant perspectives to investigate this decision problem. In the situation that the users' needs are stable, the digital products suppliers are supposed to allow the users to purchase the whole functionalities (parts of functionalities) and enjoy them permanently when the firms' target market is the common market (specialized market); however, in the situation that the user' needs are variable, the optimal providing schema for the digital products firms is just pay-per-use, which means allowing the users to enjoy the whole (parts of) functionalities in a certain time when the firms' target market is the common (specialized) market.

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## References

- [1] VARIAN, Hal R. Versioning information goods. Working Reports of Berkeley, 1997, (1). [www-inst.cs.berkeley.edu/~eecsba1/sp97/reports/eecsba1b/Final/version.pdf](http://www-inst.cs.berkeley.edu/~eecsba1/sp97/reports/eecsba1b/Final/version.pdf)
- [2] DOU, Yifan; NICULESCU, Marius F.; WU, D. J. Engineering optimal network effects via social media features and seeding in markets for digital goods and services. *Information Systems Research*, 2013, 24(1): 164-185.
- [3] NICULESCU, Marius F.; WU, Dong Jun. Economics of free under perpetual licensing: Implications for the software industry. *Information Systems Research*, 2014, 25(1): 173-199.
- [4] Li, SHENGLI; Li, FAN. The interaction effects of online reviews and free samples on consumers' downloads: An empirical analysis. *Information Processing & Management*, 2019, 56(6): 102071.
- [5] LADAS, Konstantinos; KAVADIAS, Stylianos; LOCH, Christoph. Product selling vs. pay-per-use service: A strategic analysis of competing business models. *Management Science*, 2022, 68(7): 4964-4982.
- [6] LIN, Zhijie; ZHANG, Ying; TAN, Yong. An empirical study of free product sampling and rating bias. *Information Systems Research*, 2019, 30(1): 260-275.
- [7] GENG, Wei; CHEN, Zuguang. Optimal pricing of virtual goods with conspicuous features in a freemium model. *International Journal of Electronic Commerce*, 2019, 23(3): 427-449.
- [8] CHENG, Hsing Kenneth; LI, Shengli; LIU, Yipeng. Optimal software free trial strategy: Limited version, time-locked, or hybrid?. *Production and Operations Management*, 2015, 24(3): 504-517.
- [9] HSIAO, Kuo-Lun; CHEN, Chia-Chen. What drives in-app purchase intention for mobile games? An examination of perceived values and loyalty. *Electronic commerce research and applications*, 2016, 16: 18-29.
- [10] HSU, Chin-Lung; LIN, Judy Chuan-Chuan. What drives purchase intention for paid mobile apps?—An expectation confirmation model with perceived value. *Electronic commerce research and applications*, 2015, 14(1): 46-57.