



Profit-sharing between an open-source firm and application developers – Maximizing profits from applications and in-application advertisements

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ABSTRACT

More and more for-profit organizations are promoting their products using open-source strategies. In Google's Android open-source project, the open-source firm and application developers share profits from the sales of paid applications and advertisements in free applications. Recently, the open-source strategy has received considerable attention in the literature. However, the profit-sharing model and in-application advertisements have not been well studied in the context of an open-source business. These are critical gaps in the literature, since the open-source firm may utilize a profit-sharing scheme to exercise non-coercive power and to grow the user network and advertising business. We propose a model to understand how the profit-share percentage and the percentage of paid applications, in relation to the size of the user network, affect the open-source firm's profits from applications and in-application advertisements. Our study shows that growing the user network does not necessarily increase the open-source firm's profit. Further, the study suggests that the optimal profit-share percentage maximizing the open-source firm's profit from advertisements is lower than that maximizing the profit from applications. Additionally, our study illustrates a potential threat of application developers' opportunistic behavior against the open-source firm.

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1. Introduction

Recognizing the great potential of open-source business strategies, more and more for-profit organizations are considering an open-source strategy, instead of a closed-source strategy, to promote their products (Kumar, Gordon, & Srinivasan, 2011). With a closed-source strategy, a firm maintains its control associated with the product (Casadesus-Masanell & Llanes, 2011). In contrast, with an open-source strategy, a firm makes its intellectual input for a product (e.g., a software's source code) nonproprietary by allowing other organizations and individuals to access its intellectual input (Pitt, Watson, Berthon, Wynn, & Zinkhan, 2006). In this case, a firm delegates its control associated with the product to other organizations (Pitt et al., 2006). Delegating control subsequently leads to delegating power to other organizations (Belaya & Hanf, 2009; El-Ansary & Stern, 1972).

Delegating control and power to other organizations allows a group of organizations to create value jointly (Frels, Shervani, & Srivastava, 2003). For instance, within the Android open-source project, Google, an open-source firm, discloses the source code of the Android operating system to application developers. In return, application developers develop applications for the Android platform. Successfully utilizing an open-source

strategy to promote its Android operating system, Google achieved a 79% share of the smartphone market worldwide (Al-Saleh & Forihat, 2013; Butler, 2011; Clark & Connors, 2013; Mallapragada, Grewal, & Lilien, 2012).

However, delegating control could result in opportunistic behavior by the application developers. For instance, application developers could copy the Android operating system and introduce their own operating systems, instead of developing applications for the Android platform. One way for the open-source firm to avoid partners' opportunistic behavior is to build mutual relationships with partners (e.g., application developers) using monetary incentives (Wathne & Heide, 2000). As one of the monetary incentive strategies, the profit-sharing scheme has been commonly used in the Android open-source project, where the open-source firm takes a certain portion of the profits of application developers (Gandhewar & Sheikh, 2010). The profit-share percentage of the open-source firm, defined as the percentage that application developers pay to the open-source firm out of their profits, may significantly affect the developers' motivation to join the network, the number of applications available for the platform, the size of the user network, and subsequently the success of the open-source project (Oh & Jeon, 2007; Roberts, Hann, & Slaughter, 2006). Here, the open-source firm uses the profit-sharing scheme in a positive manner to motivate its partners and to exercise its non-coercive power (Belaya & Hanf, 2009; Geyskens & Steenkamp, 2000; Wagner &

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Lindemann, 2008). However, profit-sharing schemes have received inadequate attention in the literature on an open-source business. Specifically, the effect of the user network has not been well discussed in the context of profit-sharing. This is a critical gap in the literature.

In the open-source project, application developers create both paid applications and ad-supported free applications. While generating profits by selling advertising space in ad-supported free applications to advertisers, application developers commonly charge consumers for ad-free applications (Gandhewar & Sheikh, 2010; Gordon, 2013). Thus, application developers generate profits from both applications and in-application advertisements. The open-source firm and the application developers can strategically decrease (increase) the percentage of paid applications (free applications) to attract more users to the network (Manoogian, 2012). In the Android project, Google (an open-source firm) provides the developers with the platform (the Android operating system), an application store (Google Play), and an advertising platform (AdMob). AdMob, owned by Google, is an advertising platform for application developers to monetize their applications through in-application advertisements (Bavor, 2011). In-application advertisements, similar to banner ads, are displayed to smartphone users when they use applications on a smartphone. Although advertisers are dramatically increasing their spending on mobile advertisements, especially in-application advertisements (Gartner, 2013; Infiniti Research Limited, 2013), in-application advertising has received scant attention in the literature on open-source business. This is another critical gap, as advertising is a significant source of revenue for an open-source firm (Patel, 2011).

It is the general purpose of this paper to close these two critical gaps in the literature: the use of a profit-sharing scheme and the role of in-application advertising in an open-source business model. The profit-sharing mechanism may affect the size of the user network and subsequently the success of in-application advertising, as advertisers generally prefer a bigger network (Casadesus-Masanell & Zhu, 2010). Thus, it is worthy to investigate both the profit-sharing mechanism and in-application advertisements in the context of the open-source business to close these two gaps. In doing so, we investigate how the profit-sharing scheme between an open-source firm and application developers, as well as the percentage of paid applications, affects the size of the user network and the open-source firm's profits from both applications and in-application advertisements.

In sum, our objectives are to address the following questions through analyzing our proposed model:

- Does a larger user network, achieved through lowering the profit-share percentage of the open-source firm and/or through lowering the percentage of paid applications, always benefit the open-source firm's profits from applications and in-application advertisements?
- Is the user-network size equally important in maximizing the open-source firm's profits from both advertising business and application business?
- Does maximizing the profit of the entire open-source community always lead to a win-win relationship between the open-source firm and application developers?

2. Literature review

2.1. Sources of profits and profit sharing in an open-source business

Open-source firms generate profits not only through applications, accessories, and support services for platform users (e.g., Casadesus-Masanell & Llanes, 2011; Kumar et al., 2011), but also through in-application advertisements (Patel, 2011). Through these activities, an open-source strategy, as opposed to a closed-source strategy, enhances a firm's value creation, as it allows the firm to involve more organizations and individuals in the process of value creation (Casadesus-Masanell & Llanes, 2011; Jap, 1999). For instance, an open-

source strategy enhances the variety of applications available to its platform users (Economides & Katsamakos, 2006). As the number of applications available in the Android market increases every year (Tibken, 2012), both the number of applications that users download and the amount of time they spend using these applications are on the rise (AFP Relaxnews, 2013; Nielsen, 2012). More time spent using the applications means more opportunities for in-application advertising. Consequently, application developers are providing more and more free ad-sponsored applications instead of charging for applications (Worstell, 2013).

The open-source firm uses a profit-sharing mechanism to distribute these profits from applications and advertisements. Profit-sharing mechanisms have been studied in various B2B contexts in the past, including profit-sharing between two organizations that are financially independent (Cachon & Lariviere, 2005; Chauhan & Proth, 2005; Jap, 2001), profit-sharing between two firms that form a joint venture (Du, Hu, & Liu, 2006; Wang & Zhu, 2005), profit-sharing between the franchisor and franchisee (Yan & Wang, 2012), multiple profit-sharing contracts within a supply chain (Giannoccaro & Pontrandolfo, 2004), and profit-sharing mechanisms in multi-channel contexts (Yan, 2011). The primary focus of these studies is to investigate how to utilize profit-sharing mechanisms to enhance overall profit among partners, and subsequently increase each partner's shared profit to achieve win-win relationships (e.g., Chauhan & Proth, 2005; Du et al., 2006; Giannoccaro & Pontrandolfo, 2004; Yan & Wang, 2012).

Using the profit-sharing mechanism, these studies investigate the determinants of the overall profit among the partners, including information-sharing among the partners (Yan & Wang, 2012), a distributor's wholesale price to a retailer (Giannoccaro & Pontrandolfo, 2004), a retailer's selling price, and inventory levels of a distributor and a retailer (Chauhan & Proth, 2005). Unlike these B2B contexts studied in the past, the open-source firm's success relies on the availability of applications for the open-source platform, as more applications lead to more users in the network (Frels et al., 2003; Tibken, 2012). Thus, it is critical to study how the open-source firm can utilize a profit-sharing mechanism to motivate more application developers to join the open-source platform and develop applications for the platform.

2.2. Power and control within an open-source community

The profit-sharing mechanism allows the open-source firm to exercise power over its partners through coercive action such as threats of negative consequences or through non-coercive action such as promises for positive consequences (Kumar, 2005). Coercive action includes threatening partners with the loss of any expected rewards and punishing partners (Belaya & Hanf, 2009). In contrast, non-coercive action includes the use of monetary incentives in a positive manner to motivate its partners (Belaya & Hanf, 2009). For instance, a manufacturer may promise more rewards to its suppliers to motivate them to improve their channel activities (Geyskens & Steenkamp, 2000; Wagner & Lindemann, 2008).

From an agency-theory perspective (Eisenhardt, 1989), the open-source movement offers a new type of governance structure, where an open-source firm or the principal delegates some work and authority to other firms or the agent (e.g., application developers) by making valuable information (e.g., the source code of the operating system) available to the agent. Delegating an open-source firm's authority and control to its community members allows the open-source community to have a decentralized structure (Pitt et al., 2006). For instance, in the Android community, developers are not required to get approval from the open-source firm to make new applications available for users (Butler, 2011). Delegating more control and power to other community members sometimes facilitates the processing of the community members' contributions (Hamm, 2005).

However, such delegation of control and power may lead to opportunistic behavior of the agents. For instance, the agent may copy the principal's idea (e.g., the Android operating system). The principal can

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