USER INVESTMENT AND FIRM VALUE: CASE OF INTERNET FIRMS

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EXECUTIVE SUMMARY

Recent years have witnessed a rapid growth in households' time spent at online. Accordingly, many internet business firms have exhibited starkly high growth recently. For instance, the annual revenue of Facebook grew from $0.78 billion in 2009 to $3.71 billion in 2011. Interestingly, the recent high growth of Facebook's revenue comes with the increased user activities on Facebook, about 200% annual growth rate, and without nearly as high growth in the expenditures on tangible assets and employees. By the very nature and as exemplified by the Facebook case, growth opportunities of many Internet firms are determined largely by the user activities, the users' time-investments in particular. Almost all of the content generation on sites like Facebook, Youtube and Wikipedia comes from the efforts of their users. They collectively spend billions of person-hours creating "user generated capital" which is then becomes an asset that produces a stream of value for fellow users, and of course, the host site itself. How can these Internet firms effectively elicit the users' investments of time at online and generate more value and cash flow?

This paper studies the mechanism of the users' investments and their implications for the firm value, and quantifies them for the case of Internet firms. Our study of the growing importance of the user activities for internet firm values can be understood in a broader context of the changing nature of the firm. Compared to the traditional physical-asset-intensive firms, a new type of firms is affected more by non-physical assets, dubbed as *intangibles*, for their core engines of growth (see, e.g., Zingales (2000), Jorgenson and Stiroh (2000), Brynjolfsson et al. (2002), Jorgenson et al. (2002), and Corrado et al. (2009).). Unfortunately, intangibles are difficult to measure, which is a main stumbling block for the study of the formation process of returns to intangibles[1]. For instance, the strategic options generated from the relationship with non-financial stakeholders, e.g., suppliers and users/customers, are difficult to measure even though their growing importance as one of the intangibles.[2] This paper contributes to the literature by defining and measuring a new category: *user-generated capital*. We quantify the causes of and firm-value-consequences of the users' time-investments as one of the firm's intangibles expensed by the non-financial stakeholders' investments.

We take our first step to use a simple benchmark model *a la* Gupta et al. (2004) to measure the explanatory power of users' investments to an Internet firm for the firm's observed market value. The key

[1] See, e.g., the 'intellectual capital' literature for categorizing and measuring various components of intangibles such as human capital, organizational capital, customer capital and so on. It is an issue of great debate whether it is useful to impute the value of intangibles from the observed market value of the firm given the firm's measured tangibles (see, e.g., Gupta et al. (2004) and Corrado et al. (2009)).

[2] For the case of customers as a key component of a firm's intangible asset, for instance, Gupta et al. (2004) show that the long-term value of customers can be a strong and stable determinant of a firm's intrinsic value.

features of our benchmark model are: (i) the formation of capital invested by users, labeled as the *user capital*, in the spirit of the perpetual inventory method and (ii) constant return, in terms of cash flows earned to the firm, to the user capital. Key parameters are estimated based on the 2003-2010 annual data on the COMPUSTAT financials and users' time spent at online by individual Internet firms.

The benchmark model is then extended to a dynamic structural model of a firm's optimal control problem in managing the user capital. Relative to the simpler benchmark model, the structural model has an advantage such that separate effects and interplay of several key fundamentals can be studied and quantified, formation process of and returns to the user capital in particular. The estimated structural model will be used in analyzing how a firm can efficiently manage the growing availability and difficulty of appropriating the surplus generated from the users' investments. Moreover, policy implications and the impact of the user capital on the US economy will be also discussed.

As discussed by many extant studies (see, e.g., Gupta et al. (2004)), accumulation of and returns to the user capital, the two key determinants of the value of an Internet firm, are likely to interact with each other given the very nature of a forward-looking optimizing firm. As a result, a structural model analysis rather than the back-of-the-envelope calculations is called for. The structural model essentially explicitly incorporates the key forces affecting a firm's optimal control problem of inducing users' investments. The model will be used to answer questions: why some firms gain more user capital than the others, and whether and why returns are not equated between the user capital and the firm's own physical capital.

In a broad context, this paper is linked to the literature on identifying and quantifying the value of unknown sources of intangible capital. We emphasize that the market value of a firm's total asset is determined essentially by the value of the ownership entitled to the firm's equity holders on the firm's growth option. We take the view that intangible assets refer to the firm's complementary relationships with its non-financial stakeholders from which surplus beyond the mere collection of contracts is created. The return on such an intangible asset is, given the total surplus per unit of the intangible asset, determined by the firm's bargaining power specific with respect to the counterparty in such a surplus-generating relationship. This paper aims to quantify the value of the user capital for the case of the selected recently-fast-growing internet firms.

Budget

Summer support for faculty and staff	$8,000
Research Assistant fellowship	$2,000
Travel expenses	$4,000

Computer resources	$3,000
Data acquisition	$3,000
Total	$20,000

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