2009 ISOM Workshop:
Technology Innovations and Market Challenges

Coordinators:
Janice Carrillo
Jane Feng

Sponsors:
Center for Supply Chain Management & DIS Forum (ISOM Department)

Information Systems and Operations Management
University of Florida
February 27-28, 2008

UF UNIVERSITY of FLORIDA

Technology Innovations and Market Challenges
2009 ISOM Workshop Program

Thursday, February 26, 2008

7pm – 9:30pm	Kick-off Dinner	Liquid Ginger

Friday, February 27, 2008

Time	Event	Location
7:30am – 8:30am	Breakfast & Welcome	UF Hilton
8:30am – 9:15am	Investments in R&D, Information Technology, and Firm Performance, Vish Krishnan	
9:15am – 10am	Versioning of Information Goods under Usage and Capacity Costs, Ramnath K. Chellappa	
10am – 10:30am	Break	
10:30am – 11:15am	Online Customer Satisfaction in the Face of Uncertainty: Evidence from Third Party Ratings, Han Zhang	
11:15am – 12:00pm	Consumer Blogging and Music Sampling: Long Tail Effects, Sanjeev Dewan	
12:00pm – 1:30pm	Lunch	
1:30pm– 2:15pm	A Hidden Markov Model of Developer Learning Dynamics in Open Source Software Projects, Yong Tan	
2:15pm – 3pm	Performance-based Advertising: Price and Advertising as Signals of Product Quality, Juan Feng	
3pm – 3:30pm	Break	
3:30pm – 4:15pm	Knowledge Management Strategies for Product and Process Design Teams, Cheryl Gaimon	
6:00 pm– 9:00 pm	Reception	Ti Amo

Saturday, February 28, 2008

Time	Event	Location
8am – 9am	Breakfast	UF Hilton
9am – 9:45am	Toward an Understanding of When to Steepen or Flatten the Core Product Performance, Glen Schmidt	
9:45am – 10:30am	Participation in Open Innovation: The Solver's Choice, Cheryl Druehl	
10am – 10:30am	Break	
10:30 – 11:15am	Software Free Trial: To Time-Lock or Not? Yipeng Liu	
11:15am	Brown-Bag Lunch	

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Vish Krishnan (UC San Diego)

Investments in R&D, Information Technology, and Firm Performance

There has been a debate raging in the management literature on the payoff associated with investments in both Research & Development (R&D) and information technology. In this study, we investigate how information technology investments moderate the impact of R&D spending on firm performance. We begin with a simple analytical model that provides the basis of our empirical model and hypotheses. We test our hypotheses using archival data from 1998-2004 for a panel of 80 large firms across three industries. Our empirical results suggest that IT spending has a significant moderating effect on the relationship between R&D and firm profitability, especially in the high-tech and pharmaceutical industries. These results shed new light on the interaction relationship between R&D and firm performance, especially in knowledge-intensive industries where the interaction effect of R&D and IT is accentuated.

[Joint work with Indranil Bardhan and Gokcen Arkali]

Ramnath K. Chellappa (Emory University)

Versioning of Information Goods under Usage and Capacity Costs

Research in economics has studied quality-differentiated product line and pricing decisions through vertical differentiation models, albeit largely for physical goods (Mussa and Rosen 1978). Such quality differentiation for information goods is also called versioning, where a vendor provides different qualities or versions of a good which sell at different prices (Varian 1997). While a recent research has suggested that the shape of consumer utilities and marginal costs affect a vendor's versioning decisions (Bhargava and Choudhary 2008), others have demonstrated the need for unique price schedules that are different from those of physical goods (Sundararajan 2004). An important assumption built into utility functions in extant models is that consumers enjoy "free disposal," i.e., more of a good cannot make a consumer worse off (Mas-Colell, et al. 1995). However, for many information goods and services, consumers' utility in product features is not strictly increasing as they suffer from usage related constraints, e.g., software consumption is intrinsically associated with memory usage. For example, even for the *same price*, a consumer may prefer a smaller bundle of Word and Excel, rather than the entire MS Office package as installing and using greater number of features may put a strain on his resources. Similarly, iPod users are restricted in the number of songs that they can store from both a storage-size and searchability point of view. Consideration of this usage constraint becomes increasingly important for mobile devices where both storage and memory come into play. This assumption of free disposal, usually represented by a monotonic utility function (even if concave in many cases), is increasingly being questioned in the case of information goods. While, a recent research in IS has examined goods with no-free-disposal (NFD) through contracts for personalization services under privacy constraints (Chellappa and Shivendu 2007), there is generally little or no research in this area where a realistic abstraction of information goods consumption has been proposed. Our research addresses these gaps through a comprehensive analysis of an information goods vendor's product-line (versioning) and pricing decisions under multiple scenarios including when there is no free disposal.

[Co-authored with Amit Mehra]

Han Zhang (Georgia Institute of Technology)

Online Customer Satisfaction in the Face of Uncertainty:
Evidence from Third Party Ratings

Electronic commerce is growing rapidly in the recent years. Yet, various surveys of online customers continue to indicate that a significant percentage of customers were not satisfied with their online purchase experience. More research is clearly needed to better understand what affects customer evaluations of their online experience and their online satisfaction, especially in the face of uncertainty. Using BizRate data, this study empirically investigates the importance of product and retailer uncertainty in a customer's online purchase decision as well as the uncertainty-reduction effects of retailer characteristics. We find that both types of uncertainty have a negative impact on customer satisfaction. However, customers are more concerned about retailer uncertainty than product uncertainty. A retailer's service quality, website design, and pricing play important roles in mitigating the negative impact of uncertainties. Specifically, service quality is shown to mitigate the negative impact of retailer uncertainty in online markets. Website design helps reduce product uncertainty when experience goods are involved. Our findings also reveal that higher price signals higher retailer quality and consumers are willing to pay a price premium to get certain quality assurance.

[Co-authors: Jifeng Luo, Shanghai Jiao Tong University; Sulin Ba, University of Connecticut]

Sanjeev Dewan (U.C. Irvine)

Consumer Blogging and Music Sampling: Long Tail Effects

The paper integrates the literatures on online word-of-mouth and the Long Tail effect to examine the inter-relationship between music blogs and consumer music sampling behavior. We draw from prior Long Tail research examining books and music albums that has focused on sales, and examine an alternate form of consumption unique to information goods — online sampling. Based on novel click-through data from a leading music blog aggregator, we find that the patterns of consumption through online sampling is different from the patterns of consumption through sales and the relationship between music blogging and music sampling differs between the "body" and the "tail" of music sales. Our results suggest blog users are more likely to try music that has been suggested by blogs that are more influential in the blogging community and that the impact of blog influence is stronger in the tail than in the body. We further find that popularity also drives sampling, but that this effect is stronger in the body than the tail. Popularity and blog influence are substitutes, in that the impact of blogs on sampling is stronger for less popular music. Put together, the results shed new light on the impact of blogs on consumer choice and on the Long Tail of online music sampling.

[Co-authored with Jui Ramaprasad]

Yong Tan (University of Washington)

A Hidden Markov Model of Developer Learning Dynamics in Open Source Software Projects

This study develops a stochastic model to capture developer learning dynamics in open source software projects (OSS). A Hidden Markov Model (HMM) is proposed that allows us to investigate (1) the extent to which individuals actually learn from their own experience and from interactions with peers, (2) whether an individual's abilities to learn from these activities vary as she evolves/learns over time, and (3) to what extent individual learning persists over time. We calibrate the model on six years of detailed data collected from 251 developers working on 25 OSS projects hosted at Sourceforge. Using the HMM three latent learning states (high, medium, and low) are identified and the marginal impact of learning activities on moving the developer between these states is estimated. Our findings reveal different patterns of learning in different learning states. Learning from peers appears as the most important source of learning for developers across the three states. Developers in the medium learning state benefit most through discussions that they initiate. On the other hand, developers in the low and the high states benefit the most by participating in discussions started by others. While in the low state, developers depend entirely upon their peers to learn whereas when in medium or high state they can also draw upon their own experiences. Explanations for these varying impacts of learning activities on the transitions of developers between the three learning states are provided. The HMM modeling of this study contributes to the development of theoretically grounded understanding of learning behavior of individuals. Such a theory and associated findings have important managerial and operational implications for devising interventions to promote learning in a variety of settings.

[Joint work with Param Vir Singh (CMU) and Nara Youn (U of Iowa)]

Juan Feng (University of Florida)

Performance-based Advertising: Price and Advertising as Signals of Product Quality

Performance-based advertising is becoming increasingly popular in the online advertising industry, where advertisers pay the publisher only when an "action" (e.g., a click-through or a purchase) is generated by the advertisement. In this paper, we study two important questions: (1) Can this emerging advertising scheme perform one of the fundamental functions of advertising—signaling product quality?, and (2) Compared with traditional impression-based advertising, what is the impact of performance-based advertising on advertisers' signaling behavior and publishers' advertising revenue?

We argue that, unlike traditional impression-based advertising where total advertising expenditure is determined by advertising exposure (e.g., air time on TV or number of lines in newspapers), total advertising expenditure under performance-based advertising is determined by the amount of actions generated by consumers, which is not directly observable by the viewer of the advertisement. Our analysis also reveals that two critical factors significantly affect the signaling function of performance-based advertising: (1) The demand uncertainty factor, which measures advertisers' uncertainty about their potential market, and (2) the advertising performance over-measure factor, which describes the extent to which product performance accounts for advertising performance. We find that the uncertainty factor facilitates, but the over-measure factor impedes (or even destroys) the signaling function of performance-based advertising.

[Co-authored with Jinhong Xie]

Cheryl Gaimon (Georgia Institute of Technology)

Knowledge Management Strategies for Product and Process Design Teams

We introduce a model that explores how to manage knowledge of the product and process design teams throughout a new product development (NPD) project. The timing and the extent of knowledge that each team embeds in the NPD project determine the features and functionality of the new product and process. As a result, the knowledge developed and deployed during the NPD project drives the expected net revenue earned over the product's life cycle.

A manager impacts the levels of knowledge of both the product and process design teams over time through knowledge development (KD) of the product design team as well as knowledge transfer (KT) between teams. Knowledge development includes activities such as prototyping, simulation or attending training courses. Knowledge transfer occurs in a variety of ways including face-to-face meetings, electronic communications, and the transfer of employees. While KD and KT are pursued to increase product and process team knowledge and ultimately drive net revenue, in the short-term these investments may uncover errors that reduce the value of the knowledge previously embedded in the NPD project. When errors are uncovered, rework is triggered which simply directs the manager to pursue additional knowledge creation through KD or KT.

We show the manager should follow one of two optimal strategies for the pursuit of KD of the product design team and KT between teams. First, consider the situation where the level of knowledge of the product design team is relatively high and the level of knowledge of the process design team is relatively low at the outset of the NPD project. We find that the manager pursues KD of the product team and KT to the process team at initially high rates that decrease throughout the NPD project. We refer to this as the *front-loading strategy*. In contrast, the manager optimally delays her peak efforts of KT to the product design team until later when the process design team has more knowledge. This strategy is referred to as the *delay strategy*.

We show that design changes triggered when errors are uncovered during KD or KT significantly impact the rates and the timing of KD for the product design team and KT between teams. Lastly, we show that, depending on drivers of expected net revenue, the manager's pursuit of KD may actually substitute for KT (or vice versa) or KD and KT may possess a complementary relationship.

[Co-authored with Gulru F. Ozkan and Stylianos Kavadias]

Glen Schmidt (University of Utah)

Toward an Understanding of When to Steepen or Flatten the Core Product Performance

A new product often targets high-end customers by accentuating performance with regard to a key attribute – we refer to this as "steepening" the core product performance. However, an alternate strategy is to "flatten" performance along the core attribute dimension while heightening it along an alternate dimension (Christensen's notion of disruption). Our two-firm model suggests that depending on market conditions, both firms should steepen, both should flatten, or one should steepen and the other flatten while differentiating substantively on core performance (this differs from the general Max-Min solution). Given our finding that the optimal strategy is highly dependent on the fraction of customers who are "overshot" by the core performance, it is somewhat surprising to simultaneously find that firms realize limited payoffs from marketing efforts that alter customer perceptions of overshoot. On the other hand, design efforts that intensify the degree of steepening or flattening are more profitable.

[Co-authored with Bo van der Rhee, Nyenrode University, The Netherlands, and Weiyu Tsai, University of Utah]

Cheryl Druehl (George Mason University)

Participation in Open Innovation: The Solver's Choice

The model of Open Innovation is thriving in various forms. I investigate "brokered innovation contests" (BIC) where firms such as Innocentive act as intermediaries between companies with problems to solve (seekers) and individuals offering solutions (solvers). BIC differ from lead user innovation and open source software in particular ways, making it a unique problem.

Previous research has found that often the problems require some expertise to solve and that having a higher number of solvers is better for the seeker. However, solvers have many choices of problems as well as outside interests. What motivates them to participate? Possible motivations found in empirical research include money, status, free time, signaling, and intrinsic motivation such as enjoying problem solving. I incorporate previous empirical findings into a model of solver participation with the goal of understanding how to design BIC. Focusing on signaling motivations, I find a trade-off for the BIC sponsor where more and better solutions require a high number of solvers and the value of the signal to the solver decreases as more solvers participate.

Yipeng Liu (University of Florida)

Software Free Trial: To Time-Lock or Not?

Many software firms offer a fully functional version of their products free of charge, with a limited trial time, to ease consumers' uncertainty about the functionalities of their products and to help the diffusion of their new software. Reduced uncertainty raises consumers' willingness to pay and leads to a larger network of software buyers. Because of the positive network effect, the increased installed base brings a higher value to the software and allows the firm to set a higher price for its software. However, offering free trial software with time lock will result in a free ride to those users who have only short period of usage, inevitably cannibalizing some demand of the firm's commercial software. This paper examines the tradeoff between the effects of reduced uncertainty and demand cannibalization, and aims to uncover the conditions under which software firms should introduce the time-locked free trial software. We find that when consumers' prior belief of product functionality is relatively low and when the network effect is not very strong, it is more profitable for the software firm to offer time-locked free trial software. If the software firm has the strategic option of providing free trial software with limited functionalities, we show that the time-locked free trial is preferred when the network effect is modest.

[Co-authored with Kenny Cheng]