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Research Spotlights

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Estimating Life Cycle Sales of Technology Products with Frequent Repeat Purchases: A Fractional Calculus-Based Approach (p. 409)
Aslan Lotfi, Zhengrui Jiang, Ali Lotfi, Dipak C. Jain

Accurately predicting the sales trajectory of a product is critically important for firms' medium- and long-term planning. However, reliable sales prediction models are very difficult to find when repeat purchases or subscription renewals account for a large proportion of product sales, which is often the case for technological products. This study introduces a new sales growth model, the generalized diffusion model with repeat purchases (GDMR), to address this problem. The GDMR draws upon a branch of mathematics called *fractional calculus* and formulates a product's sales growth rate using a novel noninteger-order integral equation. Compared with benchmark methods, the GDMR is simple and easy to implement, is suitable for a wide variety of products, and predicts better than benchmark models such as time series and machine learning models. Furthermore, the GDMR can reliably recover a product's progress of adoptions even when only sales data are available. Because of these important advantages, the GDMR can help firms better understand their products' market positions and, subsequently, make more informed decisions in production and inventory planning, transportation and logistics, and sales and marketing, thus improving the effectiveness and efficiency of their business operations.

On the Same Page? What Users Benefit from a Desktop View on Mobile Devices (p. 423)
Lior Fink, Daniele Papismedov

The presentation of online content is routinely adapted to the smaller screens of mobile devices by implementing an information architecture (IA) that hierarchically restructures the information being presented to users, in conjunction with layout and size adaptations. Despite the understanding that users of mobile devices are likely to experience lower usability and higher load without such adaptations, a recent trend is to offer these users the ability to opt out of content adaptation and revert to a desktop view. In two experiments in which users are asked to make an online hotel reservation, we show that a desktop view may benefit mobile users by increasing the accuracy of their decisions. From a practical standpoint, the findings suggest that the increasing availability of the option to switch to a desktop view on mobile devices is a positive evolution that should be encouraged, particularly in situations in which users may be highly sensitive to the quality of their decisions. This study addresses the prices that mobile users pay for the convenience of content adaptation, demonstrating that an adaptation technique designed to benefit mobile users may paradoxically impair their ability to make accurate decisions.

Brand Crisis and Customer Relationship Management on Social Media: Evidence from a Natural Experiment from the Airline Industry (p. 442)
Ramah Al Balawi, Yuheng Hu, Liangfei Qiu

The rise of social media platforms has created new opportunities for successful customer relationship management (CRM) activities. Compared with traditional CRM, social media–based CRM enables brands to easily and directly communicate with their customers, which can strengthen customer relationships. The public nature of social media offers an innovative way for brands to engage and manage their customer relationships, increasing brand awareness and enabling easy access to prospective customers. However, public customer engagement on social media does not come without risk. For example, negative word of mouth on social media stemming from poor customer engagement or a brand response can disseminate and reach a large audience. Despite the popularity of social media platforms as customer relationship channels, it is still unclear how a brand crisis can change a brand's social CRM efforts. Leveraging a natural experiment setting, we investigate the impact of the United Airlines crisis on three dimensions of social CRM efforts: informativeness, timeliness, and attentiveness. Contrary to traditional CRM efforts and recommendations, we find that the brand crisis increases informativeness efforts but reduces timeliness and attentiveness efforts.

Digital "x"—Charting a Path for Digital-Themed Research (p. 463)
Abayomi Baiyere, Varun Grover, Kalle J. Lyytinen, Stephanie Woerner, Alok Gupta

We live in a time when digital technologies reshape most aspects of business and social life. This challenges received assumptions about modes of operation in

organizations. As a result, scholars and practitioners increasingly use the label "digital" to signify that something has changed to the extent that a plethora of long-established management concepts are expressed in a new formulaic form of "digital x," and x can stand for innovation, strategy, transformation, infrastructure, etc. In the information systems discipline and beyond, "digital" has emerged as an oft-used conceptual label to characterize age-long phenomena hitherto described by the IT (or x) label. There is a sense among academic and practitioner communities that digital and IT are not mere synonyms, but beyond the hype, something fundamentally different is being signaled when the "digital" label is invoked. This paper traces the intellectual roots and foundations of the growing use of "digital" as a conceptual label, identifies when the label use is warranted as well as outlines implications that the moniker holds for future scholarship, policy, and practice. In particular, the paper offers actionable guidance that enables more reflective use of the term "digital" as we move forward.

Augmenting Social Bot Detection with Crowd-Generated Labels (p. 487)
Victor Benjamin, T. S. Raghu

Social media platforms are facing increasing numbers of cyber-adversaries seeking to manipulate online discourse by using social bots to help automate and scale their attacks. Likewise, some social media users have developed capabilities to identify social bot activity at varying degrees of confidence. We exploit this user intelligence to augment traditional bot detection systems. Furthermore, not all crowd-generated labels are of equal value or credibility. Some individuals are quite adept at identifying social bot activity, whereas others may become merely suspicious but remain uncertain. We design a system inspired by speech act theory to evaluate which crowd-generated labels are most credible for augmenting bot detection system efficacy.

Value Destruction in Information Technology Ecosystems: A Mixed-Method Investigation with Interpretive Case Study and Analytical Modeling (p. 508)
Arvin Sahaym, Joseph Vithayathil, Suprateek Sarker, Saonee Sarker, Niels Bjørn-Andersen

Value destruction is intertwined with value co-creation in the technology alliances and ecosystems; this is a key reason that most partnerships fail in the real world. Managers and policymakers will be enabled to identify destructive behavioral signals right from the onset drawing on our findings that opportunism, unjust appropriation of rents, shirking, exploitation of asymmetric power, and undue dependence can initiate the value destruction process. For the partners in an ecosystem, our findings underscore that opportunistic and exploitative behaviors do not pay off in the long run as these result in collateral and unintended losses for all. Dominant partner's opportunism and exploitation of power asymmetry could give rise to a proverbial "pack of wolves," a collective of resentful partners, for "challenging/killing the lion"—replacing the hub firm itself. In this vicious cycle, original intent of value co-creation gets lost with multidimensional losses on multiple fronts to the extent that opportunities open up even for the competitors with the help of hub's former resentful complementors. Equipped with this knowledge, leaders can proactively manage ecosystem relationships keeping them on the path of originally intended value co-creation by remaining alert toward catching the signals of value destruction and reverting it deftly toward value co-creation.

To Brush or Not to Brush: Product Rankings, Consumer Search, and Fake Orders (p. 532)
Chen Jin, Luyi Yang, Kartik Hosanagar

Brushing—online merchants placing fake orders of their own products—has been a widespread phenomenon on major e-commerce platforms. One key reason why merchants brush is that it boosts their rankings in search results. Products with higher sales volume are more likely to rank higher. Additionally, rankings matter because consumers face search frictions and narrow their attention to only the few products that show up at the top. Thus, fake orders can affect consumer choice. In our paper, we find that if brushing gets more costly for merchants (e.g., due to stricter platform policies), it may sometimes surprisingly harm consumers as it may only blunt brushing by the merchant who sells a more popular product but intensify brushing by the merchant selling a less popular product. If search is less costly for consumers (e.g., due to improved search technologies), it may not always benefit consumers, either. Moreover, the design of the ranking algorithm is critical: placing more weight on sales-volume-related factors may trigger a nonmonotone change in consumer welfare; tracking recent sales only as opposed to cumulative sales does not always dial down brushing and, in fact, may sometimes cause the merchant selling a less popular product to brush more.

Social Sharing, Public Perception, and Brand Competition in a Horizontally Differentiated Market (p. 553)
Zheyin (Jane) Gu, Xinxin Li

We examine how social sharing of consumers' brand purchases (via posting selfies on social media platforms) affects brand competition in a market where different types of consumers, characterized by their distinct personal characteristics (i.e., personalities, hobbies, and lifestyles) and brand preferences (i.e., being loyal to one of two horizontally differentiated brands or neither), all desire accurate public perception of their true type. Our analysis shows that social sharing enhances the profit of

the advantaged brand that attracts a larger size of loyal consumers but can hurt the profit of the disadvantaged brand that attracts a smaller size of loyal consumers. That is, in a horizontally differentiated market, social sharing may further strengthen the competitive status of the advantaged brand. Interestingly, the disadvantaged brand may become more likely to suffer from social sharing if it follows the conventional wisdom to expand the loyal segment. When the public can learn a consumer's true type from other information sources (e.g., the consumer's online blog), social sharing of consumers' brand purchases brings a smaller profit gain to the advantaged brand. Our theoretical findings shed light on how brands can devise competitive strategies to leverage the power of social media.

Impressionable or Immune? Examining the Influence of Marquee Sellers in B2B Secondary Market Platforms for IT Products (p. 570)
Abdullah Alhauli, Wedad J. Elmaghraby, Anandasivam Gopal

Consumers around the world have moved dramatically toward online platforms. Purchasing goods and services from independent suppliers through digital platforms has become a routine part of daily life. Recently, the COVID-19 pandemic has accelerated the paradigm shift toward digital economy and servitization. Data show that ecommerce sales have grown by $32 billion during the last two years (https://www.digitalcommerce360.com/article/coronavirus-impact-online-retail/). A large part of this ecommerce is on platforms-based models, where management of the platform community remains a difficult problem. One such question often discussed in the platforms context remains: Does acquiring a *marquee* seller help the platform owner? If so, how exactly? We show that in the specific context of B2B platforms, the impact of a *marquee* seller's presence is significantly positive on prices obtained by other sellers on the platform. This is because the marquee seller generates higher prices, given its brand, and these prices become reference prices for other sellers. The managerial implications highlight the importance of acquiring marquee sellers and encourage platform owners to understand the associated price effects. Our paper suggests that platform owners should consider and target sellers with marquee brand names, as they can result in a *sugar-rush* for prices of other sellers on the platform.

The Consequences of Rating Inflation on Platforms: Evidence from a Quasi-Experiment (p. 590)
Arslan Aziz, Hui Li, Rahul Telang

Informative online ratings enable digital platforms to reduce the search cost for buyers to find good sellers. However, rating inflation, a phenomenon in which average rating increases and rating variance across listings decreases, threatens the informativeness of ratings. We empirically identify the consequences of rating inflation by conducting a quasi-experiment with a digital platform that exogenously changed its rating display rule in a treated neighborhood, which resulted in rating inflation. Using a differences-in-differences approach, we find that platforms benefit from one aspect of rating inflation: user purchases and seller sales increase because of the increased average rating. However, they also face negative consequences: rating inflation causes a decrease in user trial and a greater concentration of sales among popular restaurants. Overall, our results illustrate the potential consequences of rating inflation that platforms need to consider when designing and managing their rating system.

Differential Impact of Content in Online Communication on Heterogeneous Candidates: A Field Study in Technical Recruitment (p. 609)
Rohit Aggarwal, Michael J. Lee, Vishal Midha

Recruitment is a critical activity for companies, and companies often communicate how they value their employees along with job requirements to potential candidates in a bid to attract them. However, there is an overall lack of understanding of how candidates react to such information and how their motivation toward the job changes with such online communication. Although there is substantial work that examines the decision-making process of managers who do technical hiring, to the best of our knowledge, there is a paucity of work that investigates the decision-making process of technical candidates. The broad research question studied is how including certain content in online communication about a technical job opportunity may (de)motivate heterogeneous candidates differently in applying for the job. We capture mediating variables, such as candidate prior performance and candidate experience level, that influence the effect of different online content on candidates' propensity to apply and on candidates' minimum acceptable salary increase. By testing actual job application behavior in a field study, we find that content related to employee work efforts or personal interests can attract high performers while discouraging low performers from applying in different contexts.

Should Doctors Open Online Consultation Services? An Empirical Investigation of Their Impact on Offline Appointments (p. 629)
Wenjuan Fan, Qiqi Zhou, Liangfei Qiu, Subodha Kumar

Online healthcare portals have become prevalent worldwide in recent years. One common form of healthcare portal is the online consultation website, which provides a bridge between patients and doctors and reduces patients' time and cost when seeking healthcare services. Another form is the healthcare service appointment website, which facilitates offline visits for patients. Though nominally separate, the behaviors of the users

(including patients and doctors) on these two types of websites could be related to each other. In particular, how does opening online consultation services impact the offline appointments of doctors? Although this is an important question for healthcare portals, doctors, and policy makers, it has not been rigorously examined in the literature. We examine the overall impact of opening online consultation services on offline appointments and show that the number of offline appointments for doctors increases after opening online consultation services. Given that online consultation is a new but important way to connect patients and doctors, our findings provide useful implications for all the stakeholders—doctors, patients, hospitals, and policy makers—regarding how to integrate online and offline channels in the healthcare context.

Pricing in Nonconvex Markets: How to Price Electricity in the Presence of Demand Response (p. 652)
Martin Bichler, Johannes Knörr, Felipe Maldonado

Climate change and the transition to renewable energy sources have had a significant impact on wholesale electricity markets. This has led to renewed interest in the design of electricity markets and pricing rules for spot markets. It is well known that theoretical ideals such as Walrasian equilibria cannot be obtained because of the nonconvex nature of the market-clearing problem. Instead, current pricing rules compute linear and anonymous price signals, yet at these prices, market participants often make a loss. Such losses are compensated by individual side payments that distort the price signal and have thus come under scrutiny by regulators. In this article, the authors examine this issue in greater detail. In markets with price-sensitive or flexible demand—which becomes increasingly important with growing levels of renewables—there can be no linear pricing rule that avoids make-whole payments under the welfare-maximizing allocation. Motivated by this observation, the authors introduce a pricing rule that minimizes make-whole payments and compare it against alternative pricing schemes. Numerical experiments indicate how the novel pricing rule can substantially reduce make-whole payments without significant impact on the overall market price. The findings provide input for the ongoing policy debate on make-whole payments in wholesale electricity markets.

Text Performance on the Vine Stage? The Effect of Incentive on Product Review Text Quality (p. 676)
Dandan Qiao, Huaxia Rui

Incentivizing reviewers to write product reviews is a widespread yet controversial practice. Whereas outright fake reviews are clearly unacceptable and should be removed from any review platform, reviews contributed by incentivized consumers with otherwise authentic product experiences fall in a gray area. This paper offers a fresh perspective for us to understand conceptually the relationship between incentivized reviews and its two counterparts (i.e., organic reviews and advertisements) on the two ends of the spectrum, and it studies whether incentivized reviews are of higher text quality. The authors argue that incentivized reviewers may shift their "writing mode" from back stage to front stage and may also "compensate" for their reduced impartiality through better text quality. Drawing on recent advancements in computational linguistics, the authors demonstrate that incentivized reviews tend to have more coherent writing and cover more details, suggesting higher review text quality. Their finding highlights the often-overlooked value of incentivized reviews, which can complement an organic review system and also alleviate the cold-start problem for new products, thereby promoting healthy competition in the e-commerce era. For review platforms, the authors suggest they explicitly group and label incentivized reviews without their numerical ratings and separate them from organic reviews. In this way, we can take the best of both worlds.

Evolution of Referrals over Customers' Life Cycle: Evidence from a Ride-Sharing Platform (p. 698)
Carlos Fernández-Loría, Maxime C. Cohen, Anindya Ghose

This paper addresses how referral generation and referral value evolve throughout the customer's life cycle as a function of service usage, experience level, and past referral behavior. We look at the referral behavior of 400,000 users of a large ride-sharing platform over the duration of a year. The upshot is that users make more and higher value referrals as they become more experienced with the service and when they are using the service intensively. However, as users make referrals, they are more likely to run out of friends to refer, leading to fewer (and lower value) referrals in the future. Based on these results, we suggest how digital platforms can improve their referral programs by tailoring them to how referral generation and referral value evolve over time. The richness of our data set allows us to address two shortcomings from previous studies: modeling dynamic behavior, such as the relationship between past and future referrals, and accounting for unobserved heterogeneity across users.

Design for Social Sharing: The Case of Mobile Apps (p. 721)
Subrahmanyam Aditya Karanam, Ashish Agarwal, Anitesh Barua

With millions of mobile apps available today, app developers find it challenging to generate consumer demand. The problem is particularly pronounced in the tail of the demand distribution, where the lack of awareness may deter a high-quality niche app from being successful. App developers can develop new features,

incorporate social features to share information about their apps, and increase their relative demand. We evaluate the effect of social and nonsocial or intrinsic features on the demand for apps on the iOS platform. Our findings suggest that only niche apps can increase their demand by incorporating social features. We also find that social features that allow sharing on platforms with large audiences and stronger ties among users, such as Facebook, are most effective. Additionally, social features can increase the demand for all apps when these are introduced along with less common intrinsic features. However, low-quality niche apps should refrain from sharing information about such features on platforms with low tie strength, as this may hurt the demand. Our results demonstrate how social and intrinsic features can have a different impact on the demand of the apps based on their popularity.

Algorithmic Interactions in Open Source Work (p. 744)
Maha Shaikh, Emmanuelle Vaast

This study focuses on algorithmic interactions in open source work. Algorithms are essential in open source because they remedy concerns incompletely addressed by parallel development or modularity. Following algorithmic interactions in open source allows us to map the operational performance of algorithms to understand how algorithms work with multiple other algorithms to accomplish work. Studying algorithms working together shows us how residual interdependencies of modularity and problems not resolved by dependence on parallel development are worked around to perform open source work. We examine the Linux Kernel case that reveals how algorithmic interactions facilitate open source work through the three processes of *managing*, *organizing*, and *supervising* development work. Our qualitative study theorizes how algorithmic interactions intensify through these processes that work together to facilitate development. We make a theoretical contribution to open source scholarship by explaining how algorithmic interactions navigate across module rigidity and enhance parallel development. Our work also reveals how, in open source, developers work to automate most tasks and augmentation is a bidirectional relationship of algorithms augmenting the work of developers and of developers augmenting the work of algorithms.

Fun Shopping: A Randomized Field Experiment on Gamification (p. 766)
Yi-Jen (Ian) Ho, Siyuan Liu, Lei Wang

Gamification is an emerging digital strategy to engage users across different business domains. Gamification, defined as using game-design elements in nongaming contexts, shows great potential across domains such as education, business, and health. The significance of gamification is highlighted by a $7.17 billion global market in 2019 and is projected to reach more than $40 billion by 2024. This study examines two popular badges and leaderboards that utilize self-determination and social-comparison mechanisms to promote user engagement. We conduct a randomized field experiment (A/B testing) to quantify these effects in one of the largest shopping malls in Asia and further contrast the two games against coupons regarding various shopping outcomes. Quantitatively, badging and leaderboarding promote sales by 21.5% and 22.5% in the treatment period, respectively, whereas couponing delivers a more potent effect of 31.7%. In the posttreatment period, the gamification impacts remain significant, whereas the influence of couponing fades out. Besides, the additional analyses document the salient heterogeneous treatment effects across gender, age, and income. We also zoom in on the contrast between badges and leaderboards, showing that badging is a balanced tool for attracting the general public and leaderboarding is a double-edged sword that could encourage self-reinforcing or self-banishing. Finally, gamification encourages consumers to do more exploration, leading to significant increases in sales.

A Comparison of Methods for Treatment Assignment with an Application to Playlist Generation (p. 786)
Carlos Fernández-Loría, Foster Provost, Jesse Anderton, Benjamin Carterette, Praveen Chandar

This study presents a systematic comparison of methods for individual treatment assignment. We group the various methods proposed in the literature into three general classes of algorithms (or metalearners): learning models to predict outcomes (the O-learner), learning models to predict causal effects (the E-learner), and learning models to predict optimal treatment assignments (the A-learner). We discuss how the metalearners differ in their level of generality and their objective function, which has critical implications for modeling and decision making. Notably, we demonstrate that optimizing for the prediction of outcomes or causal effects is not the same as optimizing for treatment assignments, suggesting that, in general, the A-learner should lead to better treatment assignments than the other metalearners. We then compare the metalearners in the context of choosing, for each user, the best algorithm for playlist generation in order to optimize engagement. This is the first comparison of the three different metalearners on a real-world application at scale (based on more than half a billion treatment assignments). In addition to supporting our analytical findings, the results show how large A/B tests can provide substantial value for learning treatment-assignment policies, rather than simply choosing the variant that performs best on average.