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How Technological Innovations Influence Calendar Timing in the Marketplace

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Abstract

Historically and continuing today, technological innovations have dramatically influenced the calendar timing of marketplace behaviors including buying, selling and consumption activities, among others, by: (1) countering nature's calendar timing constraints, (2) relaxing the simultaneity constraint that historically compelled buyers and sellers to meet physically at the same time and place to trade, and (3) demystifying the calendar timing of consumption behavior. Understanding these influences promises to provide guidance for the use of technology to broaden or alter the timing and synchronization of marketplace behaviors – thereby potentially increasing access to the marketplace and enhancing product value for buyers, while improving the timing flexibility, effectiveness and efficiency of organizations' marketing efforts. Further, the marketplace influence on calendar timing of past and present advances in technology provides insights into possible timing-related criteria or objectives to guide the search and development of future technological innovations.

Keywords: Calendar-led marketing, calendar-led buyer behavior, calendar timing, consumption timing, calendars, timing, innovation, technology, seasonality

1. Introduction

Much of the influence of many technological innovations on buyers, sellers, product categories and brands is so obvious that no proof of influence is necessary. When consumers board an aircraft to jet across the continent in a few hours, push a button to access news and entertainment in real time, or tap a smartphone to talk to an acquaintance on the other side of the world, they know that technology is at work to make these and countless other day-to-day activities possible. And technology managers and marketing professionals are keenly aware of many of the markets and marketing opportunities that stem from such technologies.

Yet in other instances, technology's influence on the marketplace is more subtle and less apparent, some of its consequences unanticipated, and its marketing implications not fully understood or widely recognized. Accordingly, this paper attempts to shed light on the under-recognized impact of technology on a highly-relevant aspect of marketing – that of the calendar timing of buyer behaviors and marketing practices. In the five sections that follow, the paper investigates the influence technological innovations exert or facilitate on the calendar timing of buyers' and marketers' behaviors across major calendar cycles, such as time-of-day, day-of-week, day/period-of-month, and day/period-of-year cycles. First, for the benefit of readers not already familiar with the topic, a brief overview of calendar timing and its marketing relevance is presented. Second, product innovations are examined, especially with regard to how technology is used to fight against the calendar timing constraints imposed by nature. Next, the calendar timing relevance of the so-called "technology explosion" is discussed – including technology's obliteration of the historical constraint requiring buyers and sellers to meet face-to-face in real time. Fourth, some of the present and future marketing implications of consumption timing are addressed, as well as a few emerging technological innovations that promise to help marketers and buyers capitalize on these implications. Finally, a few summary and concluding comments are offered.

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Readers inclined to equate "technology" with high-tech or new-tech may be disappointed to find historical examples and perspectives woven throughout the manuscript until they realize why history was tapped in its development. Here's why: The impact of technology on human behavior and the presence of so many product categories and brands that owe their existence to technology have been so great for so long that technology's pervasiveness threatens to mask a significant portion of its impact.

In much the same way that the influence of culture cannot be understood or fully appreciated without stepping out of one's own culture and into another, it may not be possible to fully understand the multi-faceted impact of technology while immersed in it for several years or decades. So, in the spirit of stepping out of the familiar technology world, so to speak, historical perspectives are woven throughout the discussion. By examining the historical roots and long-term evolution of technological phenomena, the modern-day role of technology's influence on calendar timing in the marketplace is illuminated and some sense of direction as to how the continuing evolution might impact the calendar timing of buyers and sellers in the future is provided.

2. Background: Calendar Timing in the Marketplace

Appreciation for the impact of calendar timing in the marketplace has given birth to the practice and study of calendar-led marketing (CLM) and its counterpart, calendar-led buyer behavior (CLBB) (Martin, 2019). CLM is the strategic and tactical consideration of calendar periods in the development of the content and timing of marketing practices, while CLBB reflects the role of calendars and calendar timing on buyers' behaviors (Martin, 2016b). Whereas the traditional elements of the marketing mix or the "four P's" (product, price, promotion, place [distribution]) address important "what?", "where?" and "how?" questions, calendar timing – or "period" in p-terms – examines a plethora of both buyer- and marketer-related "when?" questions yielding answers that may be plotted on one or more of the four major calendar cycles displayed in Figure 1. For example, regarding buyers: When do they shop or otherwise search for product/brand information? When are they exposed to media and its advertising messages? When do they buy? When do they consume? When do they have the need or interest, and the time and money to shop or consume? What does each calendar period mean to buyers (e.g., mornings vs. afternoons, Tuesdays vs. Saturdays, winter vs. spring, Christmas vs. New Year's Eve, etc.) and what lifestyle or other behaviors are typically associated with each period? What activities and other organizations compete for time slots on buyers' calendars, and when are the most competitive periods? Otherwise, what are buyers' calendar timing practices and preferences with regard to their roles as buyers? Similarly, what's the calendar timing of marketers' practices in terms of when their stores are open for business or otherwise when they're available for customer contact, when they advertise, when they introduce new products or shelve seasonal merchandise, when they distribute coupons or schedule sale events, when they change prices, and so on?

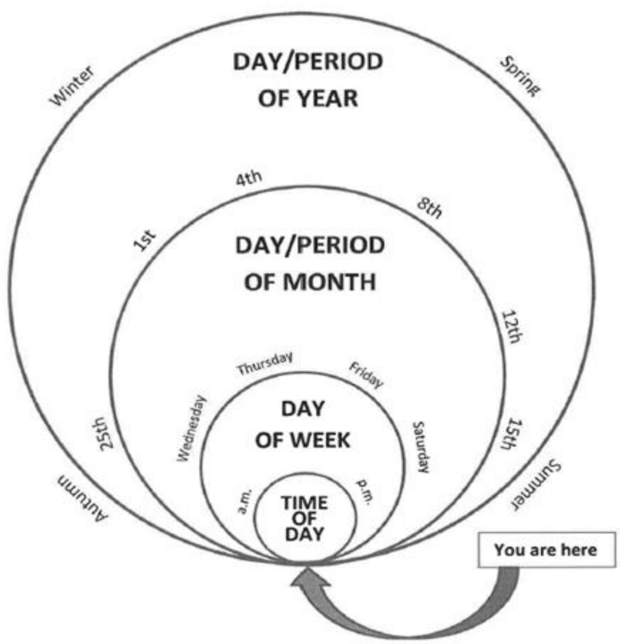

Figure 1: Four major calendar cycles of buyer and marketer behavior influenced by technology

These sorts of calendar timing questions are highly-relevant for multiple reasons. For one, it's obvious that marketing opportunities are lost when buyers' and marketers' calendars are not synchronized, e.g., when a consumer's schedule does not permit her to patronize a retail store during trading hours, when a manufacturer's sales representative and an organizational buyer can't agree upon a mutually convenient time to meet, when a buyer is never exposed to a marketing communication or when its timing fails to resonate (e.g., advertisement for snow shovels during a summer heat-wave), when a sale event is scheduled before a cash-strapped consumer's payday, and so on. Consequently, in planning their own calendars, it seems clear that astute marketers need to understand buyers' calendars and the forces that influence them – including technology.

The marketing relevance of calendar timing is further accentuated by the interrelated observations that buyers' behaviors and sentiments are neither randomly nor evenly distributed across the four major calendar cycles, and that buyers tend to be creatures of habit. So, the timing of their behaviors and sentiments often coincides with predictably reoccurring calendar periods (Martin, 2016a). These buyer propensities provide a strong indication that windows of marketing opportunity are likely to be open wider during some periods than during others. For example, time-of-day data indicating that mornings are peak demand periods for cups of coffee and that most tuna consumption in the U.S. occurs at lunch-time should alert coffee shops to the importance of being open in the morning, including tuna on the lunch menu, and advertising coffee and tuna during their respective peak periods. As another example, marketers for fast-food restaurants and entertainment centers featuring children's parties are likely to realize that a specific child's birthday party scheduled during the first week in October of the present year probably corresponds to an open window of marketing opportunity during the same week in subsequent years. As a result, the study of calendar timing in the marketplace promises to help marketers focus limited resources more productively across time periods with the greatest potential for marketing impact. Calendar-led marketers need not feel compelled to maintain a constant or equally intense marketing presence across all time periods.

3. Product Innovation: Using Technology to Counter Nature's Calendar

History demonstrates that calendar considerations frequently shape the development and positioning of new product innovations and the modification of existing ones. One common theme that seems to resonate throughout history pertains to innovations that counter or mitigate nature's calendar constraints (Martin, 2016b). That is, in the absence of many technologies, nature's calendar would reign supreme – dictating when light will be available to work, when plants will grow and produce edibles, when temperatures will be tolerable, when rain and snow events are likely to occur, and so on. Consider the calendar timing consequences of these innovations:

- Street lights installed in shopping areas in London in the 1600s pushed back the night-time darkness and thus extended the length of the shopping day for consumers and shopkeepers.
- Canning technologies introduced in the early 1800s helped alleviate nature's seasonality constraint for food products such as fresh fruits and vegetables. That is, canning extended the shelf life of produce from a few days to a few years. Similarly, frozen food technologies and numerous preservatives have extended shelf lives by fighting against food's perishable nature.
- Heating technologies made retail shopping experiences more comfortable for winter-time shoppers, while the adoption of air conditioning helped to attract shoppers during the summer months, especially during summer afternoons. Similarly, much of the appeal of today's indoor malls is their climate control design that shields shoppers (somewhat) from inclement weather and offsets nature's temperature extremes.
- Sporting venues also have looked to technology to counter nature's defaults. Ski resorts use snow-making machines to lengthen the snow season. Heated and indoor swimming pools make swimming a year-round activity. Some tennis clubs have installed lights so members can enjoy the game at night, while others have moved the tennis courts indoors for year-round utilization.
- Chemical engineers have developed additives to extend the range of temperatures within which paints oxidize, glues and cements cure, liquids remain liquid, and so on.

One example of a product category with a long history of multiple innovations that have countered or mitigated nature's calendar constraints is the automobile. For at least the first two to three decades of their existence, automobiles were generally associated with summer and daytime driving experiences. Most early models had no roofs at all and as late as 1920, 83 percent of sold automobiles were of an open-body design (17% were closed) that exposed motorists to oppressive mid-day heat in the summer, cold and snow in the winter, and rain during other months. Only seven years later, however, the percentages had reversed themselves, i.e., 85 percent of automobiles sold in 1927 were closed-body vehicles that encouraged more year-round motoring (Collier, 2006).

Headlights became standard equipment to facilitate night-time driving. Windshield wipers, heating, air conditioning, snow tires, deicers, antifreeze, and other innovations followed in response to what had been calendar constraints imposed by nature. Calendar-inspired infrastructure innovations such as improved roads, lane reflectors, street lights, illuminated traffic control signals, and 24/7 service stations accompanied the automobile's innovation evolution.

Interestingly, however, even the calendar cycle that has nothing to do with nature – the day-of-week cycle – influenced the design and positioning of automobiles. For example, the "Ute" utility vehicle was designed by Lewis Bandt in 1933 for Ford Motor Company's Australian division after the company received a letter from a farmer who wanted a temporally-diverse vehicle that resembled a coupe in the front, so he could "[take] the family to church on Sunday," but with a roadster utility box in the rear so he could "take my pigs to town on Monday" (Richardson, 2004, p. 59).

Soon after that, Ford promoted weekend use of automobiles in the U.S. by portraying Ford vehicles in print ads alongside families and couples enjoying weekend picnics in the countryside – excursions made possible by owning a Ford, the ads implied. Volvo is another example of an automaker that continued to play on the diversity of the seven-day week when, in 2002, their print ads positioned their new four-wheel vehicles as suitable for both the workweek and the weekend. The ads asserted "five days of work, two whole days of play" and included side-by-side pictures – one portraying a clean vehicle and labeled "week", and the other dubbed "ends" showing the same vehicle apparently after being driven through mud and water at a high speed (Peeters, 2007).

Today, some calendar variation in automobile use still exists, but the category's history of technological innovations and positioning has reduced the variation to a small fraction of what it once was. By transforming the product category, decades of technological innovations in the auto industry also have transformed the calendar timing of consumers' driving behavior.

4. The Technology "Explosion": Temporal Flexibility and Extended Geographic Reach

In addition to helping marketers understand the calendar-led marketplace and providing them with calendar-led product innovations to take to the marketplace, advances in technology also have reshaped the marketing landscape by infusing traditional marketing-related functions of communications and promotions, pricing, and distribution with a far greater number of calendar-led opportunities and considerations than those faced by past generations of buyers and marketers.

Much of that infusion may be attributed to technology's recently accelerated role in the obliteration of the simultaneity phenomena that both defined and constrained marketplaces for centuries throughout Europe and Asia. The "Saturday Market" in Nottingham, England, during the middle-ages, for example, was a designated physical space on the grounds of the local castle where townspeople and merchants met face-to-face on Saturdays to buy and sell selected goods not available on other market days. Typical transactions during this low-tech era featured five key elements of the exchange process – namely buyers, sellers, products, money (or barter items), and information – all simultaneously converging at the designated place and time to pave the way for commerce, as shown in Figure 2a. Other than remembering to be present at Saturday Market if they wanted to buy or sell baskets or pottery, for example, buyers and sellers didn't need to think very much about calendar timing because other viable options were limited.

Figure 2a: Simultaneous convergence of key trading elements at the "Saturday Market" in Nottingham, England during the middle ages

Particularly in recent years, advances in technology have increasingly eliminated the necessity for buyers, sellers, products, money and information all to converge at the same time and place. In many instances today, buyers and sellers may never meet. Technology enables sellers to distribute information in one or more places during multiple calendar periods, which may be considered by buyers elsewhere during subsequent calendar periods. Likewise, orders may be placed, filled and paid for across multiple locations and multiple calendar periods with buyers never visiting the sellers' physical facilities or viewing the merchandise until it's received.

So, as visually depicted in Figure 2b, what has exploded in the so-called modern-day "technology explosion" is the simultaneity constraint – not destroying the five key exchange elements but propelling them from the temporal and geographic confines of the "Saturday Market" to multiple and far flung corners of the calendar and globe.

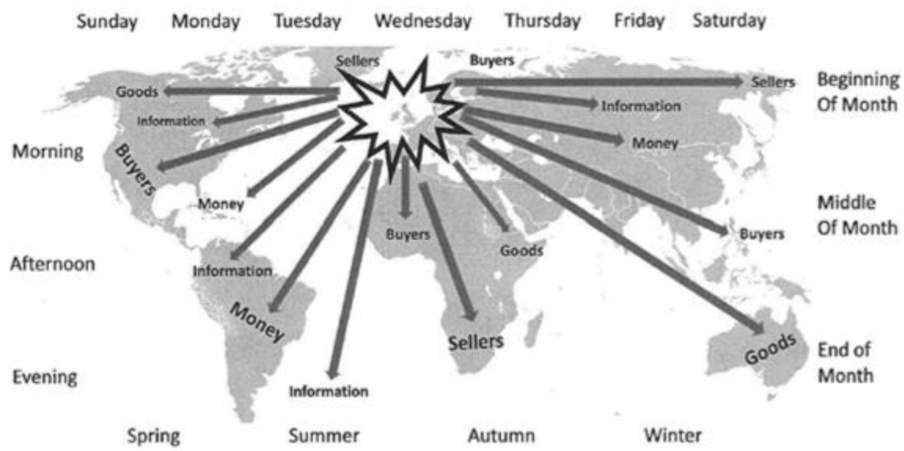

Figure 2b: Modern-day technology "explosion" propelling trade elements of the Saturday Market to distant points on the globe and calendar

4.1 Temporal Separation and Increased Flexibility

The temporal separation of buyers, sellers, goods, money and information has enormous implications for both marketers and the customers they serve, in terms of the flexibility it provides for the calendar timing of buying- and selling-related activities and for the potential creation of additional relationship-building opportunities across an increasing number of temporally-dispersed touch points. Challenges for marketers lie in understanding the endless array of calendar options, coordinating the multiple touch points, and determining when to exercise temporal flexibility in communications, product availability, pricing, trading hours, scheduling of promotional events, and so on. For buyers, an array of options may be appreciated if it contributes to a sense of behavioral control in the marketplace, but perhaps not if the net contribution is a dizzying mix of open/closed, available/unavailable, and ever-changing temporal "rules" that are confusing or difficult to remember.

While the increased temporal flexibility clearly increases the number of possible touch points and creates an infinite number of possible calendar timing options, the increased number of possibilities doesn't necessarily mean that it is wise to pursue all of them with equal vigor, if at all. The best time periods must be determined, including the criteria for what constitutes "best." For further consideration are the advantages and disadvantages of a limited presence or absence in the marketplace during some calendar periods vs. those associated with more of a continuous presence – considerations such as the possible effects on costs, total demand, market share, margins, asset utilization, employees, other channel members, and customer preferences/relationships.

4.1.1 Online Flexibility

Increased temporal flexibility is particularly apparent with online technologies. For buyers, Internet access means they can usually make purchases or acquire purchase-related information at convenient times of their choosing – unlike brick-and-mortar shopping experiences that may involve multiple timing considerations, such as waiting for scheduled operating hours to access the premises, avoiding the premises at times they're known to be crowded or when an incompatible clientele is likely to be present, or for automobile-tethered consumers, planning around "rush hours" when vehicle congestion makes shopping excursions more time-consuming. In contrast to more traditional communication vehicles such as printed catalogues and advertising inserts, online environments also offer marketers considerable flexibility in the timing of communications. That is, the relative ease and speed of revising websites enable marketers to more quickly and more frequently add, delete or change posted information regarding brands, availability, pricing and so on – potentially capitalizing on calendar variation in demand, buyers' needs, interests and price sensitivities, competitors' actions, weather and other potentially calendar-related considerations.

Many online advertising platforms, such as Facebook, Google, and numerous online media publications accommodate their advertisers' interest in ad timing by providing considerable timing flexibility including both day-of-week and time-of-day selections. Further, online data pertaining to visits, inquiries, orders, and other useful metrics is time-stamped, so monitoring it helps marketers continually fine-tune their calendar-led marketing (CLM) efforts and answer some key "When-is-the-best-time-to-_____?" questions.

In particular, marketers have not ignored the temporal flexibility associated with social media. The accessibility of social media and the ease and speed with which it can be used instantaneously without the restrictive lead times associated with more traditional media facilitate communication between buyers and sellers in either real time, if they wish, or during any targeted time period they select. Although real time communications are not necessarily right time communications, they are potentially so in that they enable marketers to respond to buyers' period-to-period changes in needs, interests, money availability, time availability, and so on, and otherwise capitalize quickly on current market conditions as they unfold (e.g., a store's announcement of a one-hour umbrella sale during an afternoon thunderstorm).

Research confirms that moods or emotional states vary somewhat predictably across calendar periods (Areni and Berger, 2008; Croft and Walker, 2001). Maguire and Geiger (2015) suggest that this cyclic variation in buyers' emotional states corresponds to cyclic variation across time periods in terms of buyers' responsiveness or predisposition to marketing communications. A message that might resonate well during one calendar period may be much less effective in another – again, accentuating the value of technology's flexibility to match the right message with the right audience at the right time.

4.1.2 In-store Flexibility

Technological advances facilitate in-store marketing flexibility as well. Among the most calendar-intriguing are digital signage and digital price displays (DPDs) that communicate merchandise information and prices to shoppers electronically. Although the use of shelf tags and signage to communicate product and pricing information is not new, such information conveyed by the electronic versions has a new advantage in that it may be changed across calendar periods – easily and frequently – to reflect calendar period variations in customer mixes and/or in shoppers' price sensitivities across time periods. Prices throughout the store may be altered frequently and within minutes through store wi-fi networks to stimulate sales when shoppers are inclined to be price-sensitive and improve margins during less price-sensitive periods. Although digital signage and DPDs are not used extensively in all markets around the world, their use is expected to proliferate in the future. Lindstrom (2011) notes that some Scandinavian supermarkets use the technology to alter prices daily, while many of their Japanese counterparts do so hourly (p. 225). The website for one DPD provider – Pricer (www.pricer.com) – asserts that its system can make 7,500 price changes in five minutes, or 90,000 in one hour (Anonymous, 2015).

In his book, *Brandwashed*, Lindstrom (2011) uses examples of buyers' shopping for whipped cream to illustrate how price sensitivities are likely to vary across calendar periods and how margins can be improved by embracing DPD technology to change prices frequently. He points out that mid-day buyers of whipped cream are likely to be making a routine purchase and may opt to strike the item from their shopping lists or purchase it elsewhere if too expensive. In contrast, a late-night shopper in search of whipped cream is more likely to need it for a special occasion and have fewer shopping choices during that time period, and thus is less likely to balk at a higher price. So, while the cumbersome and time-consuming task of changing prices may have prompted past generations of marketers to do so sparingly, today's marketers equipped with DPDs, digital signs and an understanding of the calendar-led nature of the marketplace are much better poised to match the right prices with the right periods.

4.2 Geographic Separation: Extended Reach and other Calendar Timing Considerations

By exploding the necessity for consumers and merchants to converge physically to buy and sell, technology has greatly extended most firms' potential geographic reach beyond that of the local market. Identifying, communicating with and serving geographically dispersed online buyers can be much more cost efficient than relying on traditional networks of brick-and-mortar stores to serve the same buyers. The geographic reach of many businesses is now approaching worldwide.

The wire service floral retailer, FTD (Florists' Transworld Delivery), is a good example of a company that owes its global presence to technology's elimination of the simultaneity constraint. The company ships worldwide through a digitally-linked combination of local partner florists. Customers order online and their orders are either filled by a florist located near the flowers' final delivery destination or the flowers are packed and shipped overnight.

However, seizing technology to exploit geographically dispersed and distant markets is accompanied by at least two calendar-relevant cautionary considerations. First, while technology may help to extend firms' geographic reach, it follows that their distant competitors' potential geographic reach is extended as well – right into firms' "backyards," so to speak.

Given the expense of an intense worldwide marketing effort and the reality that few, if any, brand managers challenged by encroaching competitors have unlimited resources to fight every brand battle in every geographic market, they may look strategically to specific calendar periods to selectively focus their limited resources – in much the same way that firms already think in terms of concentrating their resources on a limited number of product categories, technologies or market segments. In other words, as technology prompts the proliferation of competition, it may be that calendar-astute marketers will increasingly extend the business mantra of "not trying to be all things to all people" to "not trying to be all things to all people or at all times."

Because each calendar period is unique with respect to buyer behavior and marketing opportunities, calendar-focused marketers with limited resources may use those resources more effectively and more efficiently by targeting timeframes that promise the greatest returns. For example, knowing that consumers frequently make health and fitness resolutions for the new year, Weight Watchers spends a disproportionate amount of their advertising budget in January. A few weeks later, as the chocolate-buying Easter season approaches, advertisements for Cadbury's brand of chocolate proliferate. Similarly, a disproportionate amount of Starbuck's promotional budget targets mornings (when customers are most likely to crave coffee), while Taco Bell focuses on late nights with its promotion of the "fourth meal" concept, and more recently, on the restaurant chain's morning breakfast menu.

A second cautionary calendar consideration is the reality that the meanings associated with calendar periods can vary significantly around the world and across cultures. Accordingly, astute marketers are sensitive to the possibility of such variation and avoid blindly rolling out the same calendar-based programs across all geographic markets in which they wish to compete. Here are three examples to reinforce the point:

- TGI Friday's, the U.S.-based casual dining chain with almost 1,000 locations worldwide, asserts in its advertising that "It's always Friday at Friday's." In the United States, Friday may generally represent the end of a long work-week and be thought of as a well-deserved calendar period to party and dine, but the slogan may not resonate in Muslim countries where Friday is regarded as a holy day.
- A store's successful Columbus Day promotional event in the Southeastern U.S. to celebrate Columbus' "discovery" of the Americas in 1492, probably would not be as well-received if implemented in the state of South Dakota where many consumers refuse to celebrate the federal holiday, instead viewing the date as a mournful reminder of Columbus' "invasion."
- July 7 might be celebrated as "Subway Day" in Boston – a joyous date in the city's illustrious history when, in 1897, the Boston subway system began shuttling passengers throughout the city. But for British consumers, the association of "subway" and "July 7" is likely to evoke horrific memories of that date in 2005 when four suicide bombers killed 52 civilians and injured another 700 in London when they detonated explosives on three subway trains and a bus.

So, although technological advances enable calendar-inspired marketers to extend their geographic reach more easily and more economically than ever before, prudence is advised. That is, distant marketers must be mindful of the array of possible meanings associated with calendar periods across markets. The geographic extension of an organization's marketing reach is almost always accompanied by some degree of calendar risk.

5. Demystification of Consumption Timing

Technology has been generous in its provision of mounds of useful time-stamped data for marketing analysis, but presently the bulk of this data pertains to <u>purchase acquisition</u> and <u>post-purchase evaluation</u>. That is, marketers may know when buyers visit their websites in search of information, when buyers purchase what (either online or in-store), and when buyers use third-party websites or social media to relay evaluative information to others.

But potentially valuable data that often goes missing is that pertaining to the consumption timing of many tangible products – perhaps at all levels of analysis, but especially at more granular levels, such as individual consumer or household consumption timing. Of course, many services and some goods are purchased at or near the point of consumption, so there's little mystery about the timing of their consumption, but for other products the timing of consumption is not clearly tethered to the timing of purchase. As examples, consider the certainty vs. the uncertainty of consumption timing associated with these pairs of purchases: cups of coffee vs. cans of coffee grounds, full-service restaurant meals vs. frozen dinners, and movie theater tickets vs. DVD movies. As these examples imply, the elapsed time between purchase and consumption can range from a few seconds to several weeks or years.

To further illustrate the consumption data void and its relevance, as well as the potential contribution of technology to fill it and the need for future research, consider a retailer or manufacturer of pancake mix who knows when peak and lull purchase periods tend to occur across all four key calendar cycles and even when the Jones and Genin families (both members of the retailer's loyalty program) last purchased pancake mix. This purchase timing data could be used in many ways, such as to time promotions or communications to coincide with peak purchase periods – key calendar periods when offers and messages are likely to resonate with shoppers.

However, time-stamped purchase data may provide little insight as to when consumers, in general, or the Jones' or Genins', in particular, actually use the mix to cook and eat pancakes. Intuition might suggest, and traditional marketing research might confirm, that weekend and holiday mornings are prime periods for pancake consumption, i.e., times when household consumers may be less likely to feel rushed to get to their jobs or schools and thus are willing to spend more time than usual to prepare and enjoy a leisurely breakfast. If such detailed time-stamped consumption data were available to confirm the popular consumption of pancakes on weekend and holiday mornings, one implication would be the timing of marketing communications to reach consumers during or near these calendar periods. In the case of pancakes, point-of-consumption timed messages might increase total consumption or "share-of-breakfast" by reminding consumers to reach for the pancake mix in the pantry instead of alternative breakfast items.

Fortunately, advances in technology are moving marketers closer to understanding the calendar timing of consumption, and the pace of this movement is accelerating rapidly. One category of these technologies has been dubbed "the Internet of Things" (IoT) which allows geographically dispersed networked devices to share data in real-time with operations personnel, service technicians, suppliers and marketing analysts (McClelland, 2019). Refrigerators equipped with sensors, for example, can detect and alert refrigerator-owners (e.g., homeowners, restaurant operators) and their suppliers when regularly-stocked food items are in low supply. These alerts can trigger predetermined resupply instructions automatically relayed to suppliers. Over time, patterns in the timing of triggered alerts indicate when food items tend to be consumed.

The Coca-Cola Company is one example of a firm that has capitalized on IoT with respect to calendar timing and marketing opportunities. In the 1990s the company began utilizing technologies of the day (i.e., radio signals and wire-line transmission) in tests that enabled individual vending machines to alert suppliers in real-time when Coke products were nearly sold out, thus enabling suppliers to respond in a timely manner and avoid sales-jeopardizing stock-outs. These forerunners of IoT devices were launched successfully in 1995 (Associated Press, 1995) and provided vendors with more detailed data that enabled them to identify and anticipate timing demand patterns with greater precision. Today, the company's self-serve touch screen Freestyle fountain machines, introduced in 2009, allow analysts to monitor the quantities dispensed of each of more than 100 Coke products – time-stamped data available for calendar analysis by time-of-day, day-of-week, day-of-month and day-of-year.

Amazon.com is another example of a firm that has recently used IoT and other emerging technologies to demystify the calendar timing of consumption. The company's recently-tested DASH service enabled household consumers to program smartphones or other devices with lists of their favorite brands of routinely purchased household consumables, including food items, toiletries, household cleaning supplies, and so on. Whenever consumers noticed that listed items were in low supply they could either flag that item on their device or push an electronic signaling button placed at a convenient location in the home, such as near where the item is normally stored or used. For example, a button representing a specific brand of laundry detergent might be affixed to the family's washing machine. Pressing the button – presumably during or near the time of consumption – relayed an alert to the consumer's reorder app and to Amazon.com and its DASH partners, such as the laundry detergent brand management team in this example.

As a result, both Amazon.com and its partners gleaned potentially useful consumption timing data to help understand consumers' usage patterns and possibly to time marketing communications during specific calendar periods that coincide with consumption periods for target markets, in general, or during even more precisely-customized time periods selected to target individual consumers, in particular. Although Amazon's pioneering DASH buttons were retired in early 2019 – largely replaced by Amazon's Alexa Voice Shopping (Cakebread, 2019) – the potentially potent role that technology can play in helping marketers more accurately distinguish between purchase and consumption timing remains promising.

Additional consumption timing insights may be inferred from the drone delivery services expected to be offered very soon by Amazon.com and other firms. When implemented, drone deliveries could reach households within 30 minutes or less. As consumers gain confidence in these services and realize they can be resupplied almost effortlessly and within minutes, the technology may contribute to some (many?) consumers' transformation from stockpiling consumers to "just-in-time" (J-I-T) consumers, in much the same way that J-I-T production processes have prompted manufacturers to reconsider the wisdom of stockpiling inventories. Rather than stockpiling larger quantities purchased every several days or weeks, J-I-T consumers may be inclined to place more frequent but smaller orders just prior to episodes of consumption.

Product categories and brands may be affected too in that the online restocking services, such as DASH-like reordering, may not be particularly conducive to side-by-side brand comparisons, so consumers using these services may exhibit a preference for familiar and trusted brands. Of course, much research will be called for as drone delivery and IoT-facilitated DASH-like services are introduced and adopted, but the emergence of a J-I-T consumption culture in the future promises to contribute to the demystification of consumption timing by closing some (many?) of the timing gaps that now exist between purchase and consumption.

6. Summary and Concluding Thoughts

Given the influential and growing roles played in the marketplace by both calendars and technology, it seems logical and promising to consider the marketing relevance of the intersection of these two important topics. That's what this paper has attempted to do. Of course, technology is well-recognized for the important roles it plays in helping organizations understand the marketplace, develop product innovations, and facilitate other marketing-related functions. However, rarely articulated is the ever-increasing number of marketing-relevant calendar timing considerations and opportunities that accompany technological advances and transform markets. After a brief discussion of the marketing relevance of calendar timing in the marketplace, some of the ways technology shapes calendar timing were explored.

First, given that nature provides the world's default calendar, several centuries of technological innovations have served to counter or mitigate nature's calendar constraints – truly transformative innovations such as lighting, heating, air conditioning, canning and preservatives, among others, that greatly influence the timing of marketplace behaviors and the range of calendar periods during which products are used. The evolution of the automobile exemplifies one industry's commitment to innovate against nature's calendar constraints, with the net effect of numerous innovations being the transformation of motoring from a primarily daytime summer activity to a largely anytime activity today.

Second, the technology "explosion" was discussed, with a focus on what technological advances explode -- namely the historical marketplace constraint of buyers, sellers, goods, money and information converging at the same time and place to facilitate trade. The "explosion" has propelled these five key trading elements to far flung corners of the globe and the calendar. Today, a buyer in one part of the world may receive product information during one time period, place an order later with a seller located elsewhere, pay for it at a different point in time, and receive it after that. Such temporal and geographic dispersion of trading nuclei create an unlimited number of timing options and opportunities, but also are accompanied by a few cautionary considerations.

Third, the distinction was made between the timing of purchase-related behaviors and the timing of consumption. Although today's technologies provide marketers with an abundance of time-stamped data regarding the timing of purchase and many pre-purchase behaviors, less data is available regarding the timing of consumption. But this is changing as IoT and other technologies promise to make consumption timing data available for increasingly granular levels of analysis. Such technologies could dramatically transform the marketplace by facilitating a culture of just-in-time consumption behavior.

Given the exploratory nature of this paper, coupled with the reality that the evolution of technology is a continuous, never-ending process, much work remains for both marketing practitioners and marketing scholars to fully understand the influence of technology on calendar timing in the marketplace. To the extent that this paper provides fodder to stimulate additional thought, practice and research, it has served its purpose.

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