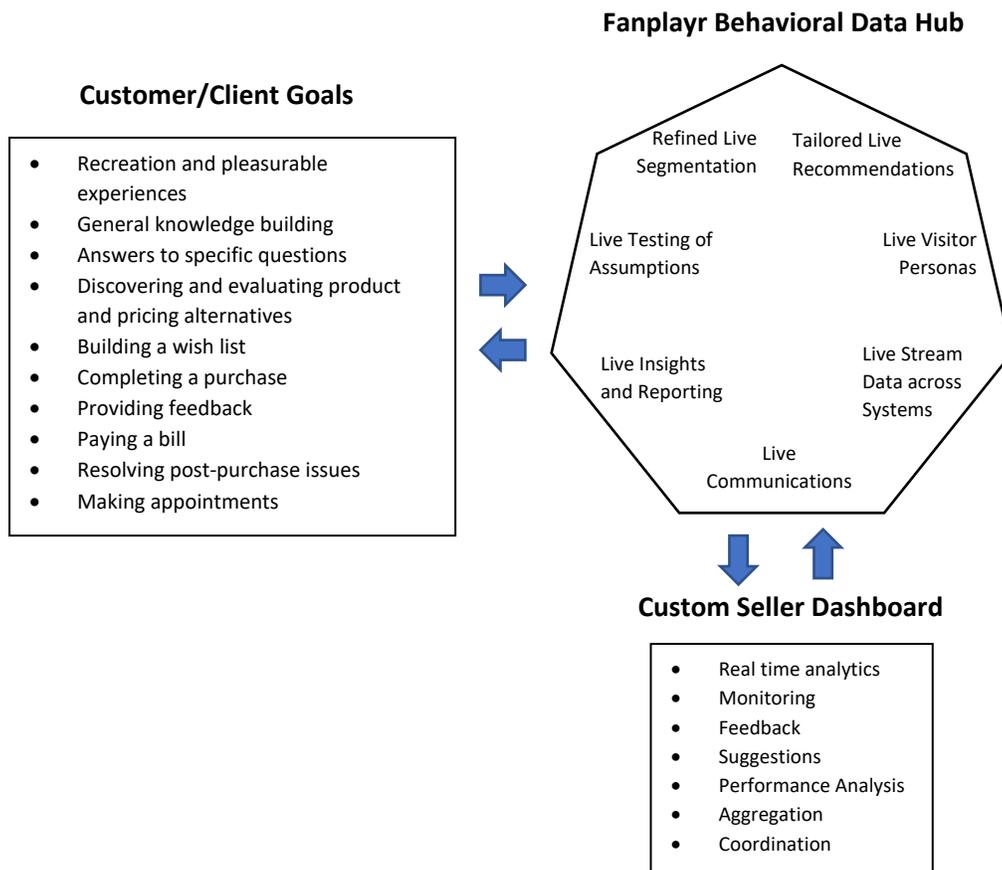


Digital Commerce in the Post-COVID Network Age



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1. Introduction

If we date the beginning of the network age to the creation of the ARPANET in 1969, we have just entered the era's third quarter-century. The first 25 years of this era saw the development of the basic infrastructure, particularly the Worldwide Web, and was driven by visions of making information available as never before in human history. In the second quarter-century, goals of public good were supplemented, and often indirectly supported, by commercial motives, as private-sector innovation took advantage of the foundations laid by governments and universities. This period has seen explosive change in how societies and economies work: in general information gathering, consumption of entertainment and news content, social interactions, and purely commercial activities.

The vision of the network age's first quarter-century has been realized to the point that the availability of information threatens to be overwhelming, in quantity, and in the ability to sort that quantity by quality and value. Achieving the goal of managing information intelligently will be the driving force of this era's third quarter-century, now in its early phase. The tools for making this happen will come from the broad field of Artificial Intelligence (AI), including its narrower or more modestly-titled components or cousins, machine learning, deep learning and data analytics. In applying this broad set of tools and approaches, there are different challenges in different dimensions of the network economy: search, content consumption and socializing each requires its own tailored approach.

Nowhere is the need to tailor the tools to the problem more pressing than in digital commerce, where achieving productive customer engagement and successful transactions are major challenges. The early evolution of activities on the network – with economies of scale in the

supply of services as well as on the demand side¹ shaping vital portions of “customer journeys” – distorted some forms of investment. In particular, the resources devoted to driving traffic to websites of sellers or service providers far outstripped those spent on the “digital last mile” (Singh and Yencken, 2020), where engagement and transactions are most effectively handled. The dominance of a few large firms in network activities such as search and socializing has contributed to this distortion, but that situation was starting to change when the COVID-19 pandemic accelerated the process.

In this paper, we summarize ongoing trends in digital commerce, along with the impact of COVID-19. Then we describe the general evolution of responses to these trends, as well as underlying challenges specific to digital commerce. The fourth section provides a more focused discussion of how the tools being used to meet the existing and emerging needs of digital commerce, and the concluding section offers summary remarks and a guide to future potential. The lesson of the decades-long progress of the impacts of electric power on the working of economies over a century ago² is that the third quarter-century of the network age will be the most transformative yet.

2. Ongoing Trends and the Impact of COVID-19

A Pew Research study of US consumer behavior, published in December 2016 (Smith and Anderson, 2016), and based on a survey conducted the previous year, found that 79% of respondents had made an online purchase, with over half of those making purchases at least weekly³ or a few times a month. This was a dramatic increase from the first Pew survey of this type, conducted in 2000, when only 22% had made online purchases. Tellingly, while many respondents still compared online prices with those in physical stores, and reported that physical inspection or trial of a product was important before purchase, using cellphones for information gathering within stores was becoming common. Furthermore, there was evidence of a shift away from cash as a payment method, with many consumers reporting making in-

¹ The latter are aptly called network economies: see, for example, Shapiro and Varian (1999).

² The first electricity generating stations were introduced in 1881, but significant productivity impacts did not show up for over four decades. See David and Wright (1999) and Harford (2017).

³ This was described, picturesquely and tellingly, as being “as often as we take out the trash” (Paquette, 2017).

store payments with their cellphones. In sum, the importance of commerce mediated by digital networks has grown beyond pure online purchases. Meanwhile, global smartphone penetration had crossed an astonishing 80% not long after the Pew survey (Deloitte, 2017).

The plain numbers on the embrace of online shopping and other aspects of digital commerce were mirrored in the precipitous decline of physical retailing; what has become commonly known as the “retail apocalypse” (e.g., Duprey, 2019).⁴ Thousands of stores, and sometimes entire retail chains, have closed, and others were already struggling by 2019. Even so, the percentage of US retail sales that were online in 2019 was only about 11% (US Department of Commerce, 2020), though growing rapidly.⁵

It is well known that people are creatures of habit. By 2019, online commerce was making deepening inroads in these habits, but from a low base. Often, online sellers had to compete with inertia by offering lower prices, as in the case of electronics items, resulting in price deflation for these categories (e.g., Perez, 2020). All this changed with the COVID-19 crisis and shelter-in-place restrictions around the world. In the US, April 2020 saw an almost 50% jump in online sales, including a doubling in online sales of groceries and books, and an almost 60% increase for electronics. Simultaneously, as the option of going to a store to browse was unavailable, online prices in many categories firmed up or increased.⁶

In many cases, the surge in online sales involved physical pickup arrangements, as many stores adapted to the new health and safety requirements. Browsing and deciding in a physical store was no longer possible. But even as lockdowns are relaxed and stores reopen, social distancing

⁴ See Singh (2019) for a further discussion of this phenomenon. In numbers, in the US, thousands of retail stores are closing every year, with tens of thousands of retail jobs being lost. According to data from the US Bureau of Labor Statistics, retail jobs increased from 2010 to 2017 as the economy recovered from the financial crisis and recession of 2008-09. But then well over 1000,000 retail jobs disappeared, even as the economy continued to grow robustly. Thus, 2017 appears to be an inflection point for the retail industry. The data are available at https://data.bls.gov/timeseries/CE5420000001?amp%253bdata_tool=XGtable&output_view=data&include_graphs=true.

⁵ If one excludes certain retail categories such as gas stations, bars and automobile dealers, where online sales effectively did not exist, the percentage would increase to about 16% (Young, 2020). Of course, as discussed later in the paper, the pandemic has changed this as well, creating an opportunity for purely online automobile sales, for example.

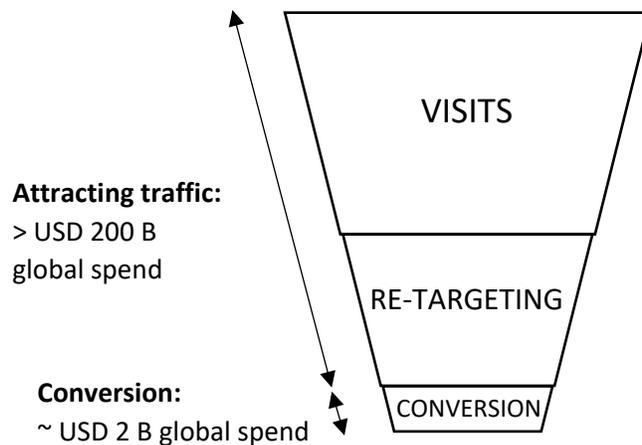
⁶ The numbers are from Abramovich (2020), which is based on the monthly Adobe Analytics Digital Economy Index, available at <https://www.adobe.com/experience-cloud/digital-insights/digital-economy-index.html>.

requirements and the uncertainties of contagion likely herald a long-term shift to online browsing and purchasing, even when fulfillment is achieved by a curbside pickup. In particular, the recreational and experiential aspects of shopping will undergo changes.⁷ This process will present challenges as well as opportunities to online sellers, including retailers, but also service providers such as banks, utilities and telecom companies.

3. Challenges and Responses

The challenges of digital commerce in the post-COVID era have their roots in the unbalanced development of the second quarter-century of the network age. The emergence of giants in the areas of online search and socializing distorted the patterns of spending that shaped digital commerce. Specifically, spending on attracting traffic to digital commerce websites has far outstripped expenditures on making that traffic meaningful and productive, i.e., leading to completed transactions and satisfied customers and clients. Figure 1, “The Conversion Funnel,” is a simple illustration of the existing imbalance. The bottom of this funnel, what Singh and Yencken (2020) describe as the “digital last mile,” is where the opportunities for digital commerce innovation now lie.

Figure 1: The Conversion Funnel



Source: Singh and Yencken (2020).

⁷ For earlier analyses of consumer shopping behavior, see, for example, Bloch and Richens (1983), Guiry et al. (2006), Xia (2010) and Liu et al. (2012).

Of course, conversion is short-hand for a complex set of goals and interactions. Website visitors may be gathering general information (browsing), weighing specific features, choosing options, comparing prices, trying to bundle different offerings, looking for an answer to a question, and so on. So, a successful visit might be reflected in the “care” that the customer, client or visitor receives (Singh and Yencken, 2020), as well as the final goal of “conversion.” Other terms for this complex set of interactions include “customer experience” and “customer journey,” which refer to the process rather than the goals of the seller or service provider.

In the case of digital commerce, the challenges of customer conversion and care were early targets of another of the giants of the network age, Amazon.com. Its first-mover advantage was leveraged into a platform for many kinds of sellers, small and not-so-small. It has offered an increasing range of services to would-be competitors, softening that competition in the process. But the efficiencies that come with that partnership have their own costs: dilution of brands, distancing from customers, and loss of control of the vital stage of “customer conversion and care.”

A recognition of this distortion was already emerging before the pandemic, as were concrete responses. What made these responses possible were advances in AI and its cousins, more specifically, in techniques of machine learning and data analytics. These advances are the hallmarks of the third quarter-century of the network age, and will drive its evolution in multiple ways: healthcare, public policy, digital commerce and more. An early example of this development was Runa, a company which created a software platform for dynamic responses⁸ to site visitors, specifically aimed at increasing conversion rates. In particular, Runa focused on calculating optimal discounts that would convert more visitors to buyers, rather than paying for increased traffic. The company met success with a free shipping offer program for eBay, using an algorithm for optimal targeting of offers. In 2013, soon after Runa began adding other customers, it was acquired by Staples, the second-largest online retailer at the time, and the largest seller of office supplies (Guleri, 2013).

⁸ In other words, the platform used machine learning algorithms, with site-specificity for sellers and service providers.

A different kind of example is that of Adobe Target, an enterprise tool offered by Adobe Systems. While the software offers many potential capabilities, it is complex to manage, and requires a team of people to be constantly coding, making it cumbersome and expensive in practice.⁹ This example illustrates the complex challenges of the digital last mile: not all “AI” is equal,¹⁰ and combining functionality, flexibility and ease of use is a goal not easily met. Luckily, several independent innovative firms are working on these challenges, such as Dynamic Yield, Fanplayr, Monetate and Wunderkind.¹¹ The details of the approaches taken, including tools used and problems solved, are discussed in the next section, after considering the landscape of consumer behavior more carefully: understanding that landscape is obviously crucial to offering successful solutions.

Many attempts to understand consumer behavior focus on basic classifications, such as browsing – examination of merchandise or service offerings “without a current intent to buy” (Bloch and Richins, 1983) – vs. non-browsing, or recreational vs. informational (e.g., Guiry, et al., 2006). Empirical studies try to identify consumer characteristics or types that influence modes of shopping behavior. They try to quantify the extent to which retail environments affect behavior, including purchases (Xia, 2010). It is well recognized that sights, sounds and smells in physical stores matter, and can enhance spending.

Earlier studies that focused on traditional shopping have been supplemented by detailed analyses of online shopping. For example, Liu et al. (2012) construct a typology of four types of “online window shoppers,” based on 16 different types of activities.¹² Of course, examples such as these are merely illustrative: they use limited categories, simple heuristics, and static assumptions. In particular, people do not neatly or permanently fit into categories, no matter

⁹ More detailed evaluation is provided in Polk et al. (2020): “Adobe Target lacks the native ability to collect user feedback, requiring custom partner integrations for customer survey design, execution and data collection. Client references also rated the company below average for its ability to drive CX [customer experience] personalization through its personalization engine.”

¹⁰ Adobe Systems characterizes Target as AI-based: another perspective is that their use of analytics and optimization falls short of “true” AI.

¹¹ However, one should note that Dynamic Yield has recently been acquired by McDonald’s, and is a candidate to follow the route taken by Runa after its acquisition by Staples.

¹² The four types are promotion finders, social and hedonic experience seekers, information gatherers, and learners and novices. The data used to create this classification was clickstream data collected in 2010-11 from a Chinese e-marketplace.

how sophisticated the classifications are. They are subject to different emotional states, and motivations that vary across time.¹³ In practice, the AI-based tools being used in the digital last mile are much more complex and dynamic, precisely designed to handle these changes. The tools in use are proprietary, but one can get a flavor of the possibilities from research studies such as Behera et al. (2020).

The central issue, however, is that the COVID-19 crisis has created both an opportunity and a challenge for online retailers and service providers, and existing approaches will need to adapt. The opportunity is that the restrictions and uncertainties generated by the pandemic have tilted the scales toward digital commerce. The challenge is that doing business online will require greater sophistication of approaches, providing more flexibility as external conditions are subject to greater flux, and more richness of experience for website visitors of all types.

4. Tools and Solutions

A good way of summarizing the approach to digital commerce that is increasingly necessary is a tag line from Fanplayr: Making Behavioral Data Actionable. How that is best done is the subject of this section. Before going into examples of how sellers and service providers can achieve the objective of the tagline, it is useful to review the strategic and environmental context.

First, as discussed in previous sections, the actions taken are meant to be those that satisfy customer, client and other visitor objectives. If the result is more effective “conversion and care,” then the seller’s bottom line benefits, either immediately (conversion) or in the future (care). Of course, these are not mutually exclusive. The unbalanced development of digital commerce, with a few giants making money off driving traffic, meant insufficient resources were devoted to the “digital last mile.” But this is already changing.

Second, progress in areas such as machine learning or data analytics has provided better tools for the digital last mile. We return to the desiderata of these tools later in this section. Third, the COVID-19 pandemic has fundamentally changed the trade-off for many consumers.

Recreational shopping and browsing in physical stores may not be as safe as they once were for

¹³ A pioneering article in a burgeoning literature, both in psychology and in behavioral economics, on these phenomena is Tversky and Simonson (1993).

a long time, and consumer habits may alter irretrievably, especially if the online shopping environment continues to become friendlier and more flexible.

Fourth, and last, there is another trend that changes the top of the conversion funnel: consumers and regulators have increasing concerns about the collection and collation of demographic and behavioral data by a few giant firms. There is something unsettling about personal characteristics or social interactions being passed on to third parties in unintended and unexpected ways. These privacy concerns are already affecting laws in major markets such as the European Union, Japan, and the largest US state, California.¹⁴ Developments like this favor the use of behavioral data that is collected in first-party contexts, after a user has already come to a specific seller or service provider website (whether to purchase or to explore). Using this dynamic, real-time data intelligently and effectively in a new kind of privacy environment is what underlies the idea of making behavioral data actionable.¹⁵

A relatively early attempt to conceptualize the needs of the digital last mile was Gartner Research's idea of a Customer Engagement Hub (CEH), viewed as an integrated "system of systems" of software tools. According to a Gartner research director, Olive Huang (quoted in Goasduff, 2016), "to offer an end-to-end customer experience across channels and departments, IT leaders must build a CEH. Only a CEH can connect employees across departments, employees with customers, and customers with their peers, while also managing and optimizing personalized customer interaction." Of course, this is a laudable concept and

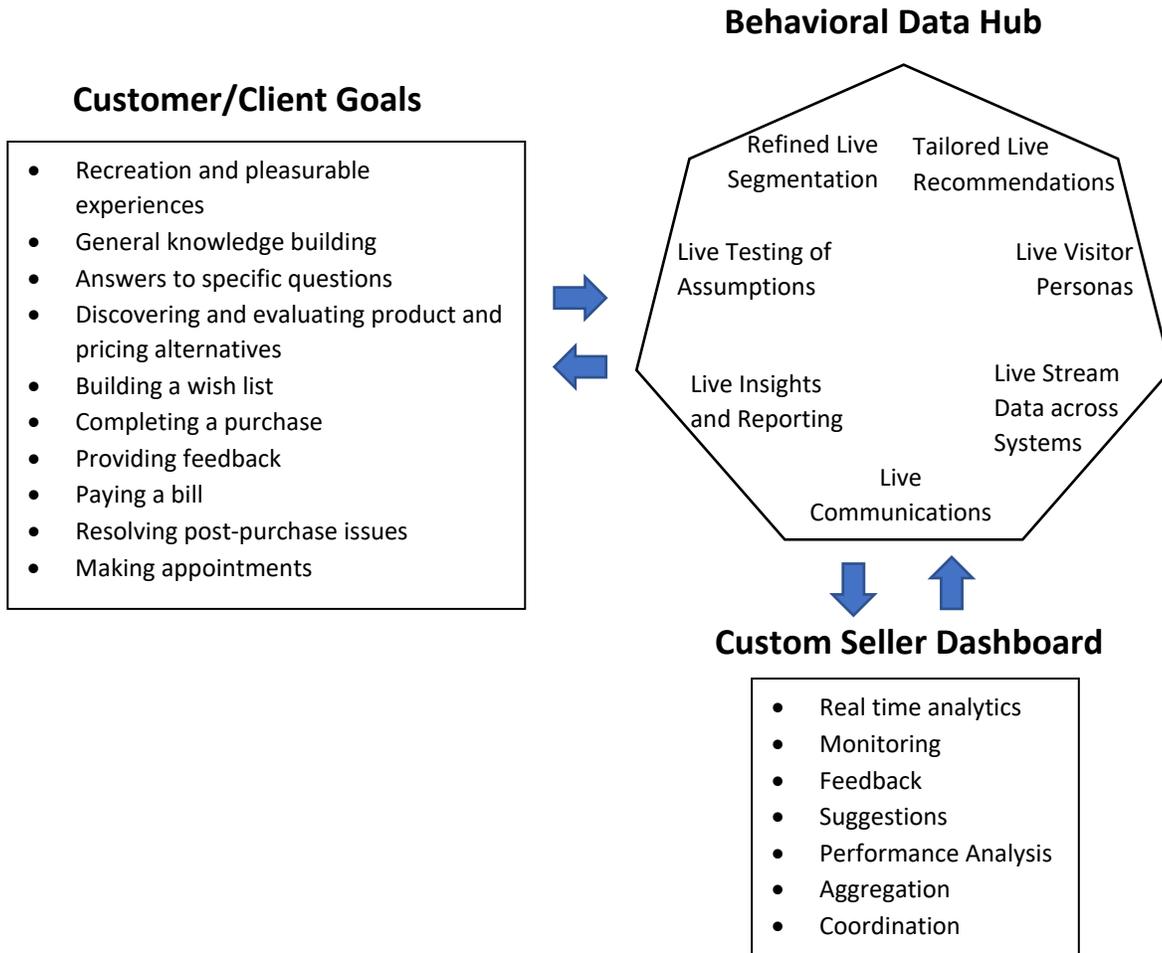
¹⁴ De Groot (2019) summarizes the new European Union regulations, including provisions requiring explicit consent and anonymization, among other individual protections, along with stiffer penalties for compliance failures, and global implications. The EU's own site (eugdpr.org) is very blunt about the changes: "The EU General Data Protection Regulation (GDPR) is the most important change in data privacy regulation in 20 years. The regulation will fundamentally reshape the way in which data is handled across every sector, from healthcare to banking and beyond." A translated version of Japanese digital privacy laws can be found at:

<http://www.japaneselawtranslation.go.jp/law/detail/?id=2781&vm=04&re=01>. California's Consumer Privacy Act, which took effect on January 1, 2020, has been described as "the toughest data privacy law in the U.S." See: <https://www.npr.org/2019/12/30/791190150/california-rings-in-the-new-year-with-a-new-data-privacy-law>.

¹⁵ Rajiv Sunkara, CTO of Fanplayr, describes the emerging situation, "While privacy protections have existed for many years and seemed enough to achieve their privacy goals, the change in technology, use cases and the proliferation of tracking services have caused browsers [referring to software] to step-up their drive against such tracking." Furthermore, "Every browser vendor has taken a different approach in their implementation of tracking prevention. One thing consistent between them is that they are all making it increasingly difficult to track a user's journey across sites." The source of these quotes is from a private communication, used with permission.

goal, but the breadth and complexity of the CEH put it beyond the reach of all but the largest companies.¹⁶

Figure 2: Digital Last Mile and Behavioral Data Hub



Source: Based on Fanplayr documents

¹⁶ Gartner Research implicitly recognizes these issues, including challenges such as the organizational changes that would be needed for a CEH (Maoz, 2012). Indeed, Maoz’s characterization of a CEH offers a daunting list of components: CRM customer service and support functionality; Content management (including video); Expertise and presence management; Knowledge management; Portals (or work spaces); Mobile platforms for customer support; Web conferencing/collaboration/cobrowsing technologies; Business process modeling and rule servers Analytics and workflows; Linguistics/natural language processing engines; Social CRM tools, such as peer-to-peer community support applications. Besides the overwhelming nature of this list, it mingles tools and objectives in a manner that ultimately obscures the goals of “conversion and care” for website visitors, customers, and clients.

What really matters for sellers and service providers, in this third phase of the network age, is the last part of the CEH description, “optimizing personalized customer interaction.” Achieving this central goal requires what Fanplayr, for example, calls a Behavioral Data Hub (BDH).¹⁷ Indeed, the centrality of live behavioral data is brought out by the term BDH. How this data is to be used is illustrated in Figure 2, which also highlights other important considerations, including flexibility of purpose and ease of use. This flexibility has to be achieved in the focused context of the digital last mile, and without sacrificing ease of use. An approach that is behavioral-data-driven is what makes this possible.

In comparison to other nomenclature such as “experience optimization platform,” “customer engagement platform,” or the generic “personalization engine” (Polk et al., 2020), the BDH terminology puts the emphasis where it belongs, on behavioral data that is generated in the digital last mile, and analyzed and acted on with immediacy.¹⁸ This allows for flexibility and sophistication in responses. What is left out of Figure 2 is also worth remarking on: the BDH is not an encompassing system of systems like the imagined CEH. At the same time, it is not a single-action solution, such as for email retargeting or testing, where decisions on whether an action is taken or not have to be pre-committed. Nor is it cumbersome and labor intensive, difficult to mesh with existing information systems, or hard to manage.¹⁹

¹⁷ Alternative, but related nomenclature is offered by other digital last mile specialists, for example, Experience Optimization Platform (Dynamic Yield) and Omnichannel Customer Engagement Platform (Emarsys). Other firms offer various tools (often called “personalization engines”) without an overarching conceptualization. The variations in terminology are revealing of differences in approach, an important issue that is discussed in this section.

¹⁸ A subtle point to be made here is that behavioral data allows for greater flexibility than “personalization,” if the latter term is interpreted as being tied to fixed personal characteristics. Instead, a focus on behavior allows for the multiple layers of people’s identities to be recognized and responded to. This difference in focus complements the earlier discussion of use of people’s demographic data in ways that do not respect privacy. The privacy issue is broader, of course, because it addresses the use of behavioral data as well, when that is done in unsanctioned ways, such as leveraging online social interactions into commercial activities. Rajiv Sunkara (private communication) highlights the importance of the specifics of the technology: “Fanplayr is able to identify and track users in a more reliable manner than other providers. This identification provides our customers with a robust and consistent manner by which to identify users, segment and target them appropriately even when deemed anonymous by other services.”

¹⁹ Some of the complexities of Adobe Target were discussed in an earlier footnote. The same source (Polk, et al., 2020) provides another example of potential ease-of-use difficulties with these new tools for the digital last mile: “While Dynamic Yield made improvements to measurement and reporting — especially for advanced users through a performance dashboard — client references cited issues with data transparency, particularly with

Turning from these technical considerations, which do matter for the practical value of any response to the challenges of the digital last mile, it is helpful to describe a few concrete applications. The most obvious set of applications pertains to successful completion of purchases, taking account of price and the features of what makes up the purchase. But in non-retail contexts, the goal may be to serve an existing client or acquire a new one – financial services are an important example. In telecoms, such as mobile phone services, both equipment purchases and choosing service features may be potential customer objectives.

As noted earlier, other visitors, whether existing customers and clients, or prospective ones, may be gathering information: answers to specific questions, general knowledge of feature options and prices, or comparison of alternatives. And in the post-COVID world, online visitors may be seeking pleasurable experiences: a sense of how they might look in a chic outfit, or a glimpse of an exotic vacation. Interestingly, this experiential pleasure has been fully incorporated in digital or other visual advertising, but often in ways that are not well-integrated into seller or service provider websites.

Of course, there are less pleasant or more routine online tasks as well: paying bills, registering dissatisfaction, scheduling a service appointment, and so on. And the same individual may be tackling these at one time, exploring or making purchases at another, and browsing for pleasure at yet another time. Effective digital tools, such as those encompassed in a BDH or some other platform or engine, have to be able to recognize and respond to the current behavior, using the data as effectively and swiftly as possible.

In a physical setting, skilled and trained sales or service associates may seek to make connections with a customer who is merely paying a bill or getting a repair done. They may look at a screen with the customer's characteristics in doing so, to guide recommendations or questions. But this can be obtrusive and cognitively taxing for both parties. Good digital tools can be more effective, if deployed in ways that are flexible, immediate and easy to use on both sides.

visibility into how data is used and with verifying specific recommendations. They also reported bugs and difficulties with data queries for reporting across multiple campaigns.”

As described in this paper, there is an opportunity emerging as a result of the COVID-19 crisis, pushing many more people to go online for a range of products and services. The digital tools for meeting customer and client needs are also becoming more sophisticated, and can work if developed intelligently, particularly in an environment where browsing tools are becoming more sensitive to privacy and controlling third-party tracking.

5. Conclusion

New technologies take many decades to evolve and for their benefits to be fully realized. This was true of electric power a century ago, and is even more the case for the set of digital network technologies. The beginning of the third quarter-century of the digital network age was already seeing the emergence of sophisticated tools for analyzing data and making decisions, in areas such as healthcare and education, as well as the many aspects of commerce that are a central part of every economy.

The COVID-19 pandemic is increasing the importance of these digital tools in all these areas, and accelerating their adoption. In digital commerce, there is enormous potential for sellers and service providers to step up the quality of their online presence, as consumers look for ways of minimizing risks while fulfilling their needs, including the experiential and recreational aspects of shopping, as well as more goal-oriented tasks such as purchases, changes in service contract terms, resolution of problems, or just basic information gathering. Meanwhile, concerns about privacy are starting to lead to regulations and industry responses for limiting third-party tracking, increasing the value of more refined approaches.

Flexible and responsive solutions such as those embodied in the Behavioral Data Hub or similar software platforms or engines will be increasingly significant in the third phase of the digital network age. Fanplayr is a good example of what can be accomplished in this regard. Light-touch integration with existing software and systems, reliable user attribution, and refined responses to users' behavior are all hallmarks of this more refined and sensitive approach to serving more and more people in a world full of new challenges.

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