



WHAT DOES THE FUTURE HOLD FOR ADVANCES IN CONSUMER INDIVIDUALIZATION?

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Abstract: *Intersecting academia and enterprise, Silicon Valley is home to titans of innovation and the digital economy. Mass customization and personalization (MCP) ushered individualization as an important economic catalyst in digital innovation. MCP encompasses many sectors that produce value, evolving from scholarship in manufacturing, to value-enabling configurators of transactional outcomes and relational benefits, to co-design and open innovation, to transformative consumer experiences. What does the future hold from Silicon Valley and beyond with regard to MCP? Based on preliminary research utilizing a small sample of expert interviews, this exploratory paper initiates a conversation on anticipated advances in three industry sectors, food, music and genomic medicine.*

Key Words: *Mass customization, personalization, individualization, digital music, food innovation, genomic medicine*

1. INTRODUCTION

Mass customization and personalization (MCP) are the realization of the “rise of creativity as a fundamental economic driver” as “[e]very human being is creative”, and by nurturing individuality and self-expression, our world is moving from “creative economy to creative society” [1]. MCP has matured to encompass many sectors that produce value for the individual, evolving from scholarly origins in manufacturing [2], to value-enabling configurators [3][4][5][6] and discoveries of the benefits in the transactional and relational nature of the co-design experience [7][8][9], to collaborative design and open innovation [10], to transformative consumer experiences [11]. What does the future hold with respect to Silicon Valley and other tech hubs for individualization in the realm of mass customization and personalization? Focused on aspects of customization and personalization technology, we discuss forthcoming advances in consumer individualization offerings from Silicon Valley and other locations, as well as explore three examples, each from the food and grocery, music and genomic medicine sectors.

The economist, Joseph Schumpeter [12] introduced his concept of “creative destruction”, that which “incessantly revolutionizes the economic structure from

within, incessantly destroying the old one, incessantly creating a new one.” He describes one of the forces of this “perennial gale of creative destruction” as the vision of the “innovator-entrepreneur”. A perfect example of this scholar’s foresight is Silicon Valley. Synonymous with innovation and entrepreneurship, the region’s DNA hails from mavericks and immigrants seeking to realize their dreams. The area’s culture is epitomized by both success and failure, the latter a badge of honor. In radio, aerospace (Lockheed), PC hardware and printers (HP), computer networking (Cisco), semiconductor and microprocessors chips (Intel) and the original internet businesses (Amazon, eBay and Craigslist), Silicon Valley is the home of information technology, particularly in the area of digital business. It is renowned as the home or birthplace of entities that have created industries, via pioneers Apple, Google, Facebook and 23andMe, enhanced sectors by the likes of PayPal and Tesla, or disrupted markets as have Airbnb and Uber. Silicon Valley’s influence on the evolution of digital innovations has realized predictions of visionary scholars of mass customization[13][14] promoted personalization, originated the on-demand economy, and spawned a plethora of digital products delivered via user interfaces enabled by smart devices, apps, and all kinds of “things”, i.e., the Internet of Things (IoT). All of these offerings have their essence in the value of individualization.

2. RESEARCH MOTIVATIONS

2.1. Current developments

What does the future hold for individualization in the realm of mass customization and personalization? In both the consumer and business arenas, the list of advancements affording users unique, customized solutions seems limitless. Take for instance, Silicon Valley startups PHILO, Arevo and zGlue: PHILO offers a kind of mini-package of television networks similar to cable television without any sports content. It has social features, among them the ability to synchronize friends watching programming together regardless of location and available across three different devices. Arevo incorporates robotics and 3D printing to deliver user-customized carbon fiber bicycles produced not in layers, but in one, all-dimension piece. zGlue offers

configurable chipsets for use by the maker market and developers of wearables and other IoT items.

Veteran providers are not resting on their laurels. Lyft is expanding on-demand transportation with purchases of bike sharing firms and scooter-sharing startups, affording consumers to, in effect, personalize how they get around town. In New York, Facebook is testing Talk the Walk, an AI-based system that communicates in natural language to assist individuals in navigating the city. Intel designs customized drone light shows not only for the outdoors, but for indoors, too. Along with Facebook, Apple and Netflix are entering digital news providing content customization options for subscribers.

Innovators beyond Silicon Valley are making strides in a variety of areas. VocalID, a Boston-based firm, produces individualized, unique voice replacement for people who are unable to speak. The Pluto Pillow is customized to one's sleeping style, while Soundmolds makes earbuds manufactured to the exact specifications of a person's ear. Relay uses robotics to design multi-use, configurable coffee tables for consumers with location- and movement-restricting disabilities. In retail, Nike continues its ever-innovating character with a concept store in the Melrose district of Los Angeles literally co-designed by neighborhood residents.

2.2. MCP examples in food and grocery, music, and genomic medicine

Among the ever-changing shifts in Silicon Valley, we researched examples in three sectors, retail food and grocery, independent music production and distribution, and genomic medicine. They are demonstrating future opportunities for new players and new business models in the MCP space. Each of these industries is facing significant business considerations and delineating factors, or mechanisms, which will shape their use of MCP. Specifically, all three sectors face 1) extremely high costs of labor, real estate, and technology; 2) increasing price pressure and need to differentiate through education; 3) a highly demanding and evolving existing MCP market; 4) an extremely competitive arena with a number of cash flush participants; and 5) growing interest in green, eco, and sustainable systems and products. The mechanisms fueling these five environmental factors within the Silicon Valley ecosystem are likely to shape both foreign and domestic markets. Falling under the realms of the financial, human, institutional, service norms and promotional categories, specific influences are likely to include, respectively, supply chain costs and payment systems; demographic and generational aspects; government, regulatory, and educational issues; placement on the continuum of whether to integrate or innovate; and internal and external identity of influencers. While there are several considerations along the lines of the organizational, market definition, and business model, of main interest to us is the nature of the value these innovations might yield, and whether the effort is based in collaboration with the customer, the core of MCP.

3. METHODOLOGY

We employed a qualitative, interview methodology to conduct preliminary research. Contacts were initiated through two channels, LinkedIn searches for experienced managers within Silicon Valley, and online searches for businesses with specific expertise in the three industry sectors. These initial contacts were asked to provide two to three additional connections, from which individuals were randomly selected and asked to provide one to two hours of time for a conversational interview. Additional criteria for each participant interviewed included a minimum of ten years in the selected sector, a requirement deemed necessary due to their significant managerial experience during economic and innovation swings.

Approximately one in 20 individuals contacted responded for interviews, or provided interview contacts, and one in 10 of those were interviewed. Participants averaged 40 years of age, and all completed college with most having advanced degrees. The final group of experts included podcasters, consultants, business owners, senior managers and clinicians. Following the initial group of interviews, interviewees were sourced using a snowball effect. Participants suggested it would be difficult to interview those from the genomic and grocery industries, which proved to be accurate. In addition, no large chain grocery store managers responded to requests for interviews. Employees in the genomic medicine sector were hindered in complying with our requests for interviews due to non-disclosure agreements (NDAs), in spite of our assurance that we would not broach topics that might involve trade secrets.

Interviews lasted between one and two hours. Before beginning the interviews, participants were given the definition of MC and provided examples of collaborative, adaptive, cosmetic, and transparent MC [15] in other industries. Interviewees were asked a series of questions to prompt both aided and unaided comments regarding industry and current research defined, specific trends. Questions included demographic, psychographic, and sector related subjects. Not all questions were asked for all interviews, since all did not apply to all industry sectors, functions, or interviewee expertise. At the conclusion of the interviews, participants were also asked if they believed the interviewer had missed any important themes related to MCP. Table 1 displays questions used during the interview:

Table 1. *Selected interview questions*

MCP
<ul style="list-style-type: none"> • Could you describe examples where MCP is being currently used in the market/industry? • What areas in MCP do you see Silicon Valley leading, and where are other locations leading? Is customization the aim of the business, or a part of a portfolio of business strategies? • There are four types of MC. Please provide examples for each type, where possible (Note: At this point, collaborative, adaptive, cosmetic, and transparent MC were defined and interviewees offered time to think and provide examples for their industry). Given these types

<p>of MC, where has your business/industry evolved in the last 5 years? Is there one type that is weakening in importance? Is there a type becoming more important?</p> <ul style="list-style-type: none"> • Do you source personal data to be used for either customization or personalization?
<p>The Future of MCP/Industry 4.0</p>
<ul style="list-style-type: none"> • Where is innovation taking place in your industry? • What are the potential pitfalls for MCP? • In 5 years (short term), where would MCP be happening? Why would this be happening then vs. 10 years (long term)? What do you know is in development now? • Where is innovation taking place in your industry? • What are the potential pitfalls for MCP? • Define “mass individualization” for your industry. If the industry were to shift its focus to this, what new products could you envision? • What is happening in these areas of innovation: tactics, financing, technology, distribution? Where is this innovation happening? What is the nature of it? • Do you have sustainability policies at your company? Does the consumer participate in the sustainability process? • How are AI, robotics, data gathering, augmented and virtual reality, and changes in demographics pushing, changing, or hindering innovation development? • What areas of your business would you like to expand the use of Big Data and AI? Do you use any Big Data services for MCP? How? Where are you limited? • Are any societal changes driving customization/personalization? • Much of customization/personalization innovation comes with reducing human touch in the process through increasing use of AI and/or robotics. Where would you like to be using robotics? Where are you limited?

Subsequently, the interviews were coded to identify topics, opinions, and descriptive words using NVivo software. The codes (aka nodes) were grouped into categories, and further analyzed to determine concept groups, trends, reinforcement of theoretical frameworks, and identification of patterns or opportunities for further research.

4. RESULTS & MCP FORECASTS

Following, we discuss findings and offer forecasts in the context of MCP based on the information culled from study participants.

4.1. Food and grocery

Innovations in the food and grocery sector include growth in providers of customized and personalized offerings. Browsing through www.newfoodeconomy.org

revealed content related to MCP and the future of the sector. Interviews exposed insights into several important mechanisms fueling the future of individualized offerings in the food and grocery industry. Among these are: increased focus on packaging, waste, and sustainability; expansion of meal kit services; volume gained through robotics and the latter’s entry into farming; “vegetable butchers”, i.e., produce butchers who custom cut vegetables and fruit for customers; local and store level buyers, food visual merchandising and the move to “market halls”, gatherings of food and goods vendors like those common in Europe; artificial intelligence (AI) utilized to increase small store profitability; divergent dietary requirements, i.e., gluten free, vegan, paleo, carnivore, etc.; locavore and community supported agriculture (CSAs) movement employing AI for delivery and assortment; and closing of big box retailers with return to and growth in small corner stores and market halls.

With polarized generational incomes and greater expectations from Millennial consumers for meal kits, diet and ingredient specificity, and fresh food delivery, we are forecasting gentrification of food sourcing. Producers will focus on these high margin consumers, using innovative AI and robotics strategies to source produce, prepare, and deliver directly into the hands what the customer wants while lowering labor costs. These customers will specify extremes in food choices, as more scientific understanding of nutrition becomes mainstream and functional longevity increasingly becomes the definition of personal health. Delivery will increasingly focus on at-work or corporate nutrition, retail and home locations, with locally based packaging and preparation to reduce waste and transportation costs. Farm based labor will continue to face shortages as government programs restrict seasonal workers, encouraging transition to robotics.

4.2. Music

The growth and evolution of digital music led to the decline in, and disappearance of, the traditional business model of retail vinyl record store sales. iTunes, Pandora, Spotify, Shazam, Amazon Music, more recent YouTube Music, and others afford a variety of MCP options for individuals to obtain their unique repertoires of music. Interestingly, this is not unlike the days where consumers purchased vinyl singles and albums amassing a library of music collections that reflected their specific tastes, which they played on record players and stereo systems, on-demand and in any order they desired.

Our interviews examined the independent music sector. They revealed seven mechanisms important to the future of music in the context of resurgent interest in vinyl records, the capacity of artists to produce these records, and the ability of consumers to obtain them. Specifically, the mechanisms in play are: a limited marketplace dominated by large corporations’ online products and profits and their need for new talent to gain sales and obtain earlier control over “art”; increased creativity with vinyl production in the form of materials like color album covers, and sound quality; minimizing HR costs while providing high touch service to “emotional” artists requiring human contact; extremely

high start-up costs and limited industry capacity to produce vinyl records due to Eastern European dominance with legacy manufacturing systems; audio consumers' high standards and expectations for a vinyl experience dwarfed by low quality, online recordings; and lack of music entry points and consumer education sources providing industry opportunities for innovators.

As noted in the food and grocery sector, Millennials are the driving force behind the resurgence in vinyl records and improved sound systems. The music industry has become largely dominated by a few players controlling all aspects of the market as channels for album producing artists dwindle. These have resulted in a split market, where the majority of consumers collect singles via online distributors, or listen via streaming services on a broad variety of sound systems, limiting artistic expression, viability and profits, while a smaller group of discerning connoisseurs operates in an extremely demanding, high margin environment. Therefore, independent artists and producers are required to generate high quality, high experience products, events, and equipment. This market will continue to fragment: the layers of educated, passionate artists and zealous consumers will develop their own ecosystems by increasing use of direct-to-consumer (DTC) manufacturing. Music distribution and legacy production systems will be replaced with new technology, robotics, and a greater focus on the artist. Millennials will continue to challenge music delivery via events, a variety of channels, and increasingly fragmented sources tied to their own, unique identities.

4.3. Genomic medicine

Genomic medicine facilitates self-knowledge through the understanding of fine gradations in personal chemistry, identification of family histories, validation or invalidation of family stories, and provision of new information on genetic relatives and communities. Its future is not in mass offerings of the past, but in provision of services that recognize, address and recommend solutions based on and tailored to an individual's genetic uniqueness. With DNA services like 23andMe, Illumina Inc., Pacific Biosciences, and uBiome genomic medicine is a robust example of MCP. Eight mechanisms are shaping the future of this sector. They are rapid development of emerging industry knowledge and discoveries, but data lacking racial diversity; evolving or non-existent government regulations; lack of understanding absolute vs. relative risk by MDs and patients; undetermined impact of lifestyle on gene expression; only 1/100th of genomic data is being used in DTC products; ethical concerns and regulatory fears concerning the impact of "playing God" or trying to outsmart "Mother Nature"; information overload overwhelming MDs, researchers, and governments, with no guarantee for personal privacy; and access to genomic analysis limited by those who can afford such offerings.

Under increasing pressure, the medical paradigm will likely shift in the next 10 years from a disease management model, where health "invaders" are the focus for medical defenses, to a biophysical model, where wellness is managed through an understanding of

DNA and lifestyle such as circadian, biome exposure, sleep hygiene, diet and workplace conditions. While the collection of DNA data is a one-time transaction, interpretation of this information is where genomic medicine's power will reside and where countless new transactions will provide customers with the individualized advice and products they need to live healthier and happier lives. This is an industry moving at breathtaking speed: the DTC model provides only a glimpse of what is possible through extremely limited reports and products, and clinical models are hampered by consumer and MD misinterpretations. This rapid increase of information and data provide an opportunity to challenge established human diagnostics and treatment protocols with the implementation of AI tools. Such tools will potentially reduce the need for highly educated, costly MDs. However, these extremely powerful tools, including gene editors like CRISPR, face a variety of governmental regulations, compounding the complexity with which companies may develop consumer products of a MCP nature.

4.4. Interview Responses

Following in Table 2 are selected excerpts and insights from respondents' comments regarding future trends in MCP in the food and grocery, music and genomic medicine sectors:

Table 2. *Selected excerpts of interview responses*

MCP
<i>Food and Grocery</i>
<p>"'Produce Butcher', a new concept where they will have a person who will cut up a Veggie to a half or quarter and they'll skin and prep it. Sous Chef?"</p> <p>"... adaptive and collaborative [MC] seem to be the most salient to the industry now... With the concept of transparent [being] how stores are stocked."</p>
<i>Music</i>
<p>"Products are art, so it is very different from most consumer goods. Every product is different and contains different goals. So for us everything is customized to the customer."</p> <p>"Rather than being customized or customizable, the standard offering is <i>packaged</i> specially for each customer."</p> <p>"... audio ... Ultimately that is what is customizable, not the music itself."</p>
<i>Genomic Medicine</i>
<p>"I make a parallel between bloodwork and genomic testing. It is the same as getting a profile for you, so I don't think that is being customized now.... The MD (medical doctor) has the ability to customize the test [for] the patient ... [but] ... the [patient] is totally blind [about telling] the doctor to do [a] complete panel ... MDs drive the decisions."</p>

The Future of MCP/Industry 4.0

Food and Grocery

“Amazon buying Whole Foods changed the game and now everyone is trying to stay relevant.”

“Local small players have a greater advantage as Whole Foods converts to a Walmart hybrid.”

“Still, organic is only 5 Or 6% of what is being sold.”

With regard to packaging, “... under 15 [US] states require recycling and manufacturers rule the roost ... until manufacturers are responsible for the cost of waste, it won’t change.”

“Drones – those are going to be huge ... currently they are used to visualize the field, release ... beneficial insects, [and act as] sensors for [the] part of the field [that] needs more water. On the other side drones [are] being used for food delivery.”

Gentrification of food availability will need to be reduced so there is “Less \$30 [per pound] cheese and fancy wine”.

“... How much will mechaniz[ation] and robotics take over human labor” reducing human touch?

“Looking backwards to the old era, small vendors/processors may have locations in high traffic area. Creation of a destination location with consistent vendors, but individualized and more small vendors with an anchor tenant.”

Music

“3D printed records are a long way off ... [because] the precision of 3D is still not going to be precise enough to cut records.”

“A band that would have made money on CDs now streams online [which] doesn’t provide the amount of money to sustain [it]. You have to tour, congregate, [have] scenes which promote vinyl and people spending money on music.”

Facebook “has a stranglehold on how music is controlling what people consume and how they consume it. The AI stuff is all going to help people get exposed [to] the music they like.”

“Apple isn’t going to have the data on my entire music library [like what isn’t my] music taste. There are a lot of errors; they are constantly being fed a narrow view. That is a problem for the tech industry. There are multiple sources of data on people.”

“Ultimately (audio technology) is what is customizable, not the music itself.”

Genomic Medicine

“... in the future, they will stratify the data to give you different slices dependent upon what you want to

see.”

“Regulation, processes, standards, have to be nailed down in the next 5 years.”

“I do see racial differences creating unique offerings down the road ... more information on an isolated population vs. a variant. If the reference isn’t comprehensive enough, your results will be meaningless.”

“We are using AI ... in general healthcare management. From the point of view of technology, AI is being used to speed up the acquisition of data. [The potential is in] interpretation of the data, making sense of information and the application of understanding medical literature ...”

5. CONCLUSION

The adage, the future is now, is an apropos sentiment for the future of MCP, not only in Silicon Valley but across the globe. Digital and scientific innovations will continued to move at a dizzying pace. This work contributes to theory by identifying developing trends in the MCP field and the food, music and genomic medicine industries. In addition, we offer information that could assist managers as they work to prepare strategic offerings.

The shifts we describe in this paper, particularly in the food and genomic medicine sectors, provide an opportunity for MCP offerings to link retail, food manufacturing, and specialty foods with genomic counseling services and the general medical community. These innovative prospects will streamline food delivery and provide accurate, strategic, and individualized nutritional support to a demanding, DTC base, improving hospital efficiencies, and building workplace productivity.

Our forecast bodes well for companies and entrepreneurs attempting to satisfy the increase in consumer appetites for unique, individualized offerings, and providers’ pursuits to meet, exceed - and generate more - customized and personalized customer solutions. The future of MCP continues to be bright with the evolution of the field’s next chapters.

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