Building the Sociomateriality of Food Service

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1. Introduction

At its core, service is about the creation and exchange of value. In food service, value is created in a complex socio-technical system that involves a plethora of stakeholders connected by a common interest: the production, procurement, preparation, service, and consumption of food and beverages (Ball et al., 2011). Despite the extremely high diversity of offerings, concepts, and operational models (from street food to take away to food courts, among others), the vast majority of food service still takes place in traditional, brick-and-mortar establishments such as quick service or à la carte restaurants (Davis et al., 2018). Furthermore, the underlying concept of food service has not changed to a great extent. People go out to eat, drink, and socialise; the service interaction is largely dyadic and employee-led in nature, and it tends to take place at the premises of the provider following a pre-dictated pace. Undoubtedly, the sector has experienced transformation through several incremental, often technology-enabled, innovations, such as tableside ordering through tablets, contactless and mobile payment, email receipts, kitchen display systems and inventory management software, as well as off-the-shelf and custom-built restaurant management systems that handle all the aforementioned (De Keyser et al., 2018). Yet, the tenets of brick-and-mortar restaurant service have remained largely unchanged for decades (Davis et al., 2018). However, at the turn of the decade the food service sector finds itself amidst a torrent of change (Bowen and Whalen, 2017).

Underlined by the global megatrends currently impacting most of the world – rapid urbanisation, climate change and resource scarcity, shift in political and economic power, demographic change, and increasingly disruptive technological breakthroughs – the way value is created and distributed across all sectors is changing (EY, 2018). In particular, hospitality and tourism service providers are faced with a paradoxical situation whereby they are expected to provide more with less. The projected radical increase in gross traveller numbers due to the increasingly affluent East combined with a generation of highly mobile global masses entering retirement age is driving demand at an unprecedented pace (UNWTO, 2019). At the same time, the sector is facing a severe

labor shortage. Many management consultants, researchers, and entrepreneurs have pointed towards emerging technology, particularly artificial intelligence (AI) and robotics, as a potential way to alleviate the situation (Ivanov and Webster, 2019).

As the ongoing and upcoming changes brought by these technologies on the food service sector are fundamental in nature, a thorough examination of what value means in food service and a proactive reformulation of service in the context of restaurants are necessary to help hospitality academics and practitioners better understand and navigate these changes. To that end, this study addresses the following research questions: What does the contemporary sociomateriality of food service look like? In particular, how are the notions of service encounter, service sequence, and the servicescape transforming? What challenges and opportunities might this transformation bring to hospitality management?

Adopting a systems approach with an innovative, future-oriented research method, LEGO® Serious Play®, this qualitative study explores the current and future state of food service by bringing together a diverse set of stakeholders (i.e., restaurateurs, hospitality and tourism executives, roboticists, technology developers, designers, and end users) to co-construct and articulate their visions for the sector. Findings contribute towards a better understanding of the changing concept of service in restaurants for both theory and practice. A framework summarising the key changes to service encounter, service sequence, and servicescape is presented along with a rich agenda for future research and actionable practical considerations.

2. Elements of food service

Davis et al. (2018) define food service as "the provision of food and beverages away from home" (p. 1). It is a highly diversified industry spread across a wide range of operations (Edwards, 2013), including licensed and unlicensed restaurants, cafés, take-away food shops and mobile food stands, catering, as well as pubs, bars, and clubs (Davis et al., 2018). Given the diversity of the sector, the systems approach (Ball et al., 2011) proves helpful in better understanding the individual parts that make up the whole of food service. Systems science as a discipline has been described as a meta-

science, a canvas of sorts on which other disciplines can interact and draw on. Operating at the highest level of abstraction, it aims to establish a holistic view of phenomena by breaking them down into interrelated systems that vary from simple (e.g., an independent retailer) to complex (e.g., the global labour market) (Demetis and Lee, 2017). In the context of food service, Ball et al. (2011) distinguish between hard and soft systems. Hard systems comprise of physical artefacts, such as tableware, combination ovens, or coffee machines, while soft systems refer to human activity, such as organizational hierarchy or operational instructions. Putting these together, a socio-technical system is formed, in which social actors (human employees) assemble around and interact with material actors (technology).

2.1 Social and material actors in food service

By its very nature, service implies interaction between someone who is serving and someone who is being served (Hudson and Hudson, 2013). The ensuing service encounter or moment of truth thereby refers to the ways in which services are delivered (Carlzon, 1989). In food service, service encounters typically involve the social interaction of hospitality professionals (e.g. cashiers, waitresses, baristas, or maître d's) and the visiting patrons. A typical interaction in food service is formed of several encounters that vary depending on the concept and context of operations (Noone et al., 2009). For example, Lillicrap and Cousins (2010) break the delivery of service in à la carte restaurants into stages or touchpoints that tend to follow one another in sequence. These are: taking bookings, preparation for service, greeting and seating, taking orders, serving, billing and paying, clearing, and washing-up.

Besides the interaction between social actors, the environments within which food service occurs play an important role in shaping the service experience (Hudson and Hudson, 2013). Bitner (1992, p. 58) refers to these spaces as servicescapes, defining them as the “manmade, physical surroundings as opposed to the natural or social environment”. For instance, the décor, tableware, signage, or ambient lighting are parts of a traditional à la carte restaurant’s servicescape. In recent years, technology has also become an increasingly important dimension of servicescape in food service. Regardless of the type of operation, food service operators are turning to smart materials and

connected objects for more efficient production, delivery, and management of service (De Keyser et al., 2019).

For example, McDonald's has made technology, including AI and robotics, a key part of its global growth strategy (Buckley and Patton, 2019). From systematically building internal competency and innovating existing processes to aggressively acquiring cutting-edge AI companies, the fast food giant is leveraging technology to increase efficiency, optimise resource use, predict and boost demand, and personalize offerings (Cheng, 2019). Over the last few years, the company has continued to streamline its back-of-house operations by introducing new grills and automated deep-fryers. In terms of front-of-house, it has started the global roll-out of its "Experience of the Future" concept, bringing self-service kiosks to most of its restaurants by early 2020s. In select markets, the company has teamed up with take-out aggregators such as Uber Eats and DoorDash to outsource delivery services, and continued to develop the take-away capabilities of its own mobile application, Click & Go. All of these changes have profound impacts on the socio-technical system of food service, radically transforming how value is created and distributed by the social and material actors.

2.2 Technology in management research

Management research has gone through several broad approaches to technology over the years. At first, technology was largely ignored in management science for decades (Orlikowski, 2010). A big shift in interest occurred in the late 1950s with the emergence of contingency theory, whereby researchers started to consider technology as hardware; a concrete causal determinant of organizational processes and outcomes, such as decision-making, productivity, or performance, both at the individual and organizational levels (Perrow, 1967; Mohr, 1982). In other words, technology was perceived as something that impacted organizations, that could be quantified and, to some extent, generalized (Leonardi, 2012). However, limited attention was given to the specific technical details of any technology, or to the role of humans in steering the development and deployment of technology as a whole (Orlikowski, 2010).

Addressing these limitations, an opposing view soon emerged, whereby technology was seen as an endogenous, socially defined and produced process, rather than a novel, exogenous add-on. Ontological priority was increasingly given to human agents, and studies began to account for the differences amongst individual technologies while also acknowledging their surrounding socio-historical and cultural contexts (Orlikowski, 2000). While this offered remarkably deep insight on specific contexts and technologies, the ability to gain insight into technologies' broader impact on reshaping organisations and more broadly, societies, was lost (Orlikowski, 2010). Combining both views, a paradigm known as sociomateriality has gained ground in management as well as information systems literature (Leonardi, 2012).

Sociomateriality sees social and material as being inseparably intertwined in organizational value creation (Jones, 2014). Looking at the system of food service, Goldstein et al. (2002) point towards the notion of service concept as a means of fitting the different pieces of restaurant service, both social and material, together. The service concept illustrates how value is created and distributed in service systems, what is being offered and how it is being delivered to customers. It does this through four key dimensions: service operation, service experience, service outcome, and the value of service (Johnston, Clark and Shulver, 2012). Driven by the global megatrends shaping the future of all sectors, there seems to be a growing pressure of the material on the social across all of these dimensions. As resources become increasingly scarce, workforce elderly, and technology ever more intelligent and pervasive, an increasing number of tasks in food service is expected to shift from human actors to material actors (Ivanov and Webster, 2019). This poses important questions about the socio-technical system of food service, and calls for a thorough reformulation of the sociomateriality of hospitality. Looking at both hard and soft food service systems (Ball et al., 2011), as well as drawing on the key dimensions of service concept, this study highlights several socio-technical trends impacting value creation in food service in 2020 and beyond. In doing so, the study forms a solid basis for hospitality and tourism scholars and practitioners to start thinking about, and ultimately leverage, emerging trends – both conceptually and practically.

3. Method

Understanding the future directions of change requires a deep appreciation of the present, as well as a desirable, commonly agreed-upon view of things to come (Inayatullah, 2009). One of the most prevalent approaches to achieving this is future workshop, a form of action research in which participants from different backgrounds are invited to share their views of the future (Jungk and Müllert, 1996). Adopting a future workshop approach, this study used LEGO® Serious Play®, a well-established qualitative research method, to bring together diverse stakeholders to reformulate the current sociomateriality of food service, as well as explore the future directions of hospitality (Tuomi, Tussyadiah and Stienmetz, 2019). Rooted in constructionism, LEGO® Serious Play® seeks to facilitate problem-led discussion on abstract, often complex social phenomena through the construction of 3-dimensional LEGO® models. The qualitative LEGO® Serious Play® approach was chosen for its ability to engage participants through leveraging the concepts of play and flow, affording stakeholders to attain a state of deep concentration and subsequently voice and reflect comprehensively on their feelings, thoughts, hopes, and concerns surrounding a research phenomenon.

Studies looking at the future typically explore either short (three to five years), medium (five to 10 years), or long-term (10 years or more) future (de Jouvenel, 2012). Inayatullah (1998; 2017) for example suggests researchers to focus on timeframes of either five years or less, or five to 50 years, depending on the desired level of abstraction, that is, from return on investment on a new technology or realisation of new policy to systems-level, structural change such as the transformation of the traditional welfare state. As this study aimed to understand systems-level changes, a long-term lens of 20 years (or one generation) into the future was deemed the most suitable. This was seen to allow sufficient time for current global megatrends to play out, while still having direct relevance to participants' lives.

In total, six LEGO® Serious Play® workshops involving 59 participants (52.5% female, mean age 34.2) were conducted between January and June 2019 in the UK. Through a series of structured LEGO® building exercises, participants were asked to imagine, construct, and share their

vision of the food service industry now and in 20 years' time (in 2039), focusing particularly on service interaction, its structure, and setting. Prior to the main data collection stage, a pilot workshop was conducted with academic peers (senior hospitality and tourism faculty, N=18) to test the workshop design and the research questions. Following peer feedback, the facilitation process was slightly modified (instructions to one building exercise were revised), and five workshops were conducted. To capture as wide a range of opinions, two of the workshops were held with industry experts working at the cross-section of food service and technology (i.e., restaurateurs, hospitality and tourism executives, roboticists, programmers, technology start-ups, designers; N=21), one with academics (i.e., hospitality and tourism researchers and lecturers; N=7), and two with the general public (i.e., end users; N=13). See Table 1 for a summary of all the workshops.

Table 1. Summary of Workshops

Time	# Participants	Gender	Affiliation
January 2019 (Pre-test)	18	10 female (~55.5%)	Hospitality and tourism researchers and lecturers
February 2019	12	5 female(~41.7%)	Restaurateurs, hospitality and tourism executives, roboticists, programmers, technology start-ups
February 2019	9	4 female (44.4%)	Restaurateurs, hospitality and tourism executives, roboticists, programmers, technology start-ups
May 2019	7	5 female(~71.4%)	Hospitality and tourism researchers and lecturers
June 2019	8	3 female (37.5%)	End users
June 2019	5	4 female(80%)	End users
Total	**59**	**31 female (~52.5%)**	

Each workshop lasted for half a day and followed the same agenda, which included an introduction to the session and method, three to four LEGO® building exercises (depending on group size), and an in-depth focus group discussion. A detailed workshop facilitation manual can be found in Appendix 1. Sessions were led and facilitated in English either by one or both of the authors, and

all the discussions were recorded, transcribed, and anonymised by one of the authors. Some of the LEGO® models were photographed for visualization purposes. However, following Tuomi, Tussyadiah and Stienmetz's (2019) suggestion that the main focus in LEGO® Serious Play® should be on the extracted meaning and metaphors, not the physical manifestation of models, visual data was not collected or analysed per se.

Emerging data were analysed thematically, with coding taking place in two stages (Braun and Clarke, 2006). First, open coding was conducted by hand to determine key themes. In total, 52 unique codes were extracted. Then, the codes were categorised hierarchically into a code tree through axial coding (Simmons, 2018). Four major themes emerged: (1) changes to service experience, (2) changes to employment, (3) changes to supply chain, and (4) changes to business model. To validate the accuracy of the established coding schema and its hierarchy, randomly selected cases (N=15) of transcript excerpts were sent to two independent coders for re-coding along with a code book. The evaluation was conducted in two stages, using two measures: percent agreement and Cohen's Kappa. First, percent agreement was calculated to establish an overall fit of themes (Roaché, 2018). A good (>0.61) agreement was established. Disagreements were discussed, the code book was modified, and disagreed excerpts were sent back for re-coding. A second round of evaluation using Cohen's Kappa was then initiated with the same independent coders. A good (>0.61) or very good (>0.81) agreement was established across all themes (Landis and Koch, 1977). Table 2 illustrates the results of both intercoder reliability checks.

Table 2. Intercoder Reliability Measures

Method of measurement	Percent agreement Coder 1	Percent agreement Coder 2	Cohen's Kappa Coder 1	Cohen's Kappa Coder 2
Theme 1: Changes to service experience	0.75	0.67	0.90	0.77
Theme 2: Changes to employment	0.75	1.00	0.95	0.86
Theme 3: Changes to supply chain	1.00	1.00	0.95	0.94

Method of measurement	Percent agreement Coder 1	Percent agreement Coder 2	Cohen's Kappa Coder 1	Cohen's Kappa Coder 2
Theme 4: Changes to business model	0.67	1.00	0.94	0.95

4. Results

Four layers of change were found to be underlying the contemporary and future sociomateriality of food service: (1) changes to service experience, (2) changes to employment, (3) changes to supply chain, and (4) changes to business model.

4.1 Changing expectations of customers

The concept of customer expectation is in constant flux; its volatility tends to drive what companies choose to serve (Jobber and Ellis-Chadwick, 2013). This came through very clearly in participants' models of the future: almost all participants saw that in an increasingly accessible and multifaceted landscape of service offerings, only food service concepts that manage to capitalize on emerging consumer trends will prevail. In particular, participants noted the growing importance of three trends shaping customer expectations: seamlessness of experience within and across the sector, transparency of operations, and personalization of service experience and offering. Across all three, participants frequently emphasised an increased influence of material over the social.

Seamlessness. Restaurant-goers will expect increasingly seamless, effortless, and intuitive offerings. Participants emphasized that maximising immediacy by removing any touchpoints that do not add value will be key in the future of food service. Further, seamlessness of experience will increasingly expand beyond individual operators to cover the entire sector, as customers expect to be able to use their own digital devices (e.g., personal wearables) or existing social media profiles across different restaurants ubiquitously. As a result, developers need to find ways to make data compatible and interconnected, and managers need to put policies in place to facilitate open data-sharing.

"*I think technology will enhance the customer experience by removing a lot of the kind of laborious, manual detail and free up people to actually deal with the guest*." (Roboticist, male)

"*Everything will just get more convenient, and people like that, whether you rage against that or not. It's just the way we are*." (Hospitality Executive, male)

Transparency. Participants also expected the notion of conscious consumerism to continue to increase in importance in the future, whereby customers will expect to know where, how, and under which conditions their food has been produced, delivered, and prepared, with technology playing a key part in facilitating this. Participants also saw that this transparency will extend beyond supply chains to include the health and safety of employees to ensure the longevity of careers.

"*The customers' mindset is very different to what it used to be. And when you look at that from a brand perspective, it's not easy. There's a lot of stakeholders* [who] *you're accountable to. You have to look at the big picture*." (Hospitality Executive, female)

Personalization. There was strong consensus that customers will expect restaurant experiences to be increasingly personalized. This will include both the service encounter (e.g., offering a plethora of ways for customers to go through their respective journeys) and the offering (e.g., collating a menu of your choice from the ingredients of your choice, getting recommendations based on your actual nutritional needs). Much of this was seen to be driven by technology and intelligent data analytics.

"*A person can only know so much. But a computer is able to know an insane amount, and would be able to say, hey, I can give you this exact flavour, and I can give it to you with great nutritional content as well. In any shape you want. A chef will never know that, not even if you've gone to that same place every day for your entire life. It's never going to be as good*." (General User, female)

4.2 Distribution and meaning of work

The last few years have witnessed industrial-grade technology, such as spatially and situationally aware robotics or intelligent learning algorithms, entering hospitality (Tussyadiah and Miller, 2019). This has allowed forward-looking operators to start optimizing and automating some, or all, of their customer- or employee-facing tasks or processes (Ivanov and Webster, 2019). There was strong

consensus amongst workshop participants that this trend will continue to evolve. The day-to-day running of restaurant operations will become increasingly streamlined for the business, as well as more meaningful and fulfilling for the employees.

Distribution of labor. Research looking at the uptake of automation technologies (e.g. service robotics) has strongly asserted that automation tends to follow a common trend, whereby the most simple, repetitive tasks will be automated first and the less frequent, complex tasks second (Flynn and Wilson, 2019). With regards to food service operations, participants predicted that gains in efficiency will be sought both back- and front-of-house. Proactive re-design of existing processes and practices supported by emerging technology and intelligent data analytics were seen as key.

"*It's about looking at what processes are currently done by people, where the human doesn't add any value. Like taking you to your table, or giving you a bill. If you can find a thing that is currently irrelevant, and you can make that more simple, then actually you're enhancing the experience of the customer, which means that the staff will also see happier customers. It's a positive feedback loop."* (Restaurant Executive, male)

Meaning of work. Delegating the most routine tasks to material actors allows operators to create more consistent, standardized service offerings (Ivanov and Webster, 2019). However, according to Huang and Rust (2018) it may also offer executives an opportunity to allocate employees to focus on more complex tasks in service production and delivery, particularly ones requiring creativity, problem solving, or empathy. Reflecting this, participants noted the implications technology will have on what it means to work in the sector, as well as the kinds of skills required from future workforce.

"*I think food is something that requires human love. And so I still have a human chef* [in the LEGO® model]. *But there is a robot that the chef can order to do all the things he doesn't want to do anymore. So maybe slicing vegetables, etc. I think that should be down to individual chefs. And what it does is, it allows chefs to focus more on doing the things that they love."* (General User, female)

"You're going to invest a lot more in people that can drive an experience. So, the types of jobs that I think you will see in more hospitality-driven places is like, everyone will start to get an experience

that is closer to what you get at the Four Seasons, where it's like everyone knows who you are, everyone makes you feel great, everyone is entertaining you and making you feel much more hospitality-driven. [...] *I think that bartenders of the future are going to make great, great money, whereby they're going to become a huge part of the experience. They won't be making the cocktails, you will have automated systems that are going to make cocktails much more consistently and faster, and to a degree of customisation that a person just can't do. But a bartender will be there to like, really, really drive an experience for you."* (Roboticist, male)

4.3 New ways of producing and procuring ingredients

Material actors are likely to have impacts on the way food services are produced and consumed beyond novel customer experiences and task reallocation. Macro-level trends participants saw likely to increase in importance included new ways of producing food, as well as technology facilitating more efficient supply chain management.

New ways of producing food. The growing population, as well as the apparent and unsustainable toll our current food production systems put on the environment, call for novel ways of producing food if we are to feed up to 9 billion people in 2039 (UN, 2019). Innovations participants saw on the horizon to address these challenges included vertical farming (i.e., growing crops at scale locally through techniques such as hydro- and aquaponics), new sources of protein (e.g., insects), as well as synthetically produced food (e.g., lab-grown meat).

"*Also the food itself… for example some of these vegan burgers that have been developed. People have different ways of doing it, but effectively it's creating food in a factory. Food that couldn't have been created by the chef. I think we're probably going to see more of that; food that just isn't possible to be done through traditional methods."* (Hospitality Academic, male)

"If it offers advantages, people get used to it, and it will feel weird going back to some old [food production] *system that doesn't have the same advantages. Why would you pay more for something that has less. Perhaps when things are going to take over, it will just evolve. And it will be the survival*

of the fittest, and the fittest may not necessarily be the man or the human." (Restaurant Executive, female).

More efficient supply chain management. Participants also predicted changes to the way in which goods are transported and delivered. For example, the ubiquitous use of connected autonomous vehicles (Cohen and Hopkins, 2019) and other industrial robotics applications as well as developments in drone technology were seen to facilitate on-demand delivery of ingredients, improving and in some cases automating supply chain management.

"*Drones… the optimisation of supply chain will probably make restaurants have smaller amounts of stock, and lead to fresher restaurants."* (Hospitality Executive, male)

"We essentially bring together industrial robotics with machine vision and machine learning, combining all of those things to be able to deal with the production management process in the food sector and have predictive purchasing at scale." (Roboticist, male)

4.4 Agile and inclusive business models

While predicting the future can be challenging, one thing is certain: businesses need to proactively adapt to changes in their operational environment to stay relevant (Damanpour, 1991). According to participants, this will mean innovating existing processes and operational conventions as well as actively looking to capture additional market share.

Adaptability of operations. To keep pace with changes to the socio-technical system of hospitality, participants imagined how changes to infrastructure and the physical layout of restaurants could facilitate new, more agile business models, from modular kitchens to multipurpose servicescapes.

"*I think restaurants will become a multi-purpose space… So it might be a coffee shop at day, it might be a library at night; you might have a space which has shifting usages within a day*." (Hospitality Executive, male)

Increased accessibility and new experiences. Participants also identified several currently underserved customer segments and markets, many of which could be tapped into with advancements

in technology. These included ubiquitous service in customers' native tongue, services that focus on minorities or people with special needs, as well as dining in remote or extreme locations, solo dining, virtual dining, and the desire to reconnect with nature.

"*I think that perhaps the restaurant of the future will be more suited for individuals* […]. *For example, if you're there by yourself, and you want to go to the bathroom, you have to take your bag and stuff with you. Simple things like that. So thinking about, if the restaurant of the future could be more individual diner friendly, and how technology and automation would be able to facilitate those sort of things*." (General User, male)

5. Discussion

The sociomateriality of food service is witnessing fundamental changes across the four primary layers of service concept: service operation, service experience, service outcome, and the value sought in and from service (Johnston, Clark and Shulver, 2012). Together, these form a new socio-technical system of hospitality, whereby the conventional assumptions regarding well-established concepts in service research will transform. In particular, the service encounter, service sequence, and the servicescape will see changes at several fronts. The following section will discuss these in detail, build a research agenda for further study, propose a conceptual framework of the sociomateriality of food service, and finally point towards areas that hospitality practitioners should consider as not to face the change unprepared.

5.1 Theoretical implications

Technology has changed the way we live our lives. It has made its way into every aspect of modern life, be it governance, commerce, or leisure. An increasing amount of decisions and processes is supported, facilitated, or delegated to technology. As such, the pressure of material over social is growing, posing several implications to conventional service research. A theoretical framework depicting the sociomateriality of food service is suggested in Figure 1.

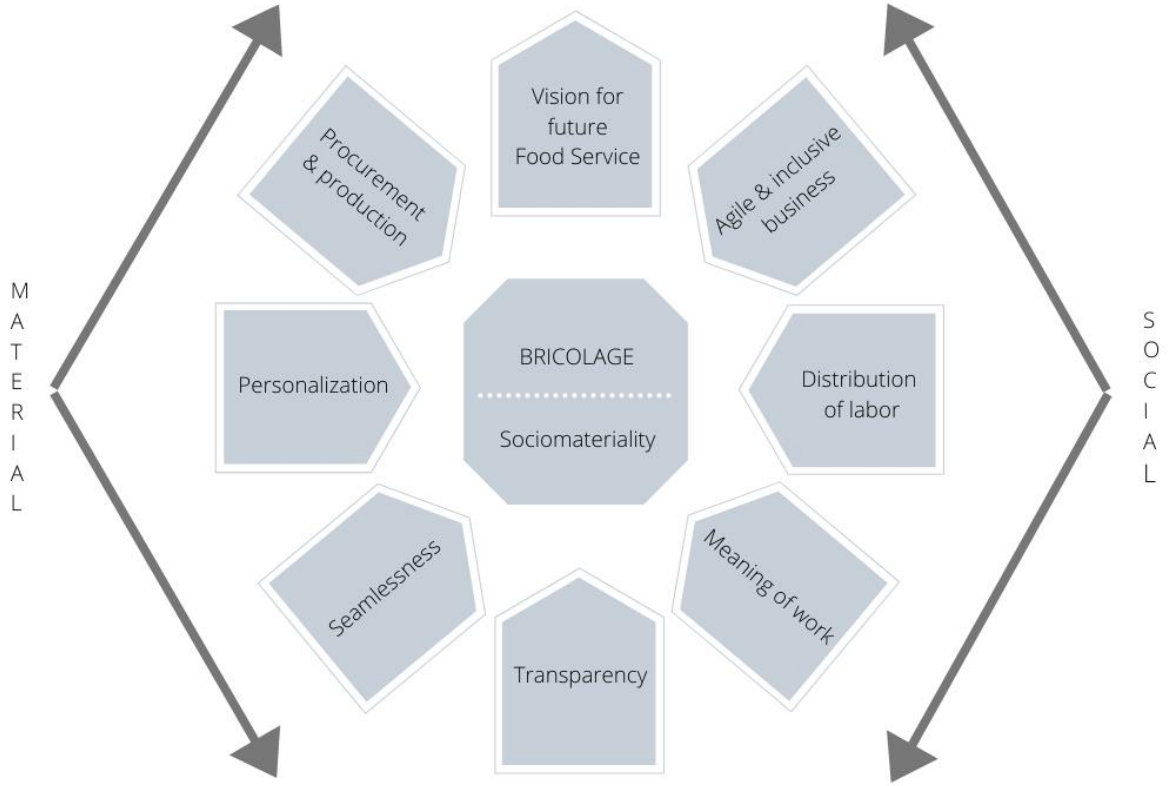

Figure 1. A Framework of Sociomateriality of Food Service

5.1.1 Service encounter

Several authors have noted the transformative power of technology on the service encounter, whereby new technologies such as digital platforms, self-service kiosks, and service robots, among others, disrupt the dyadic relationship between consumer and service provider and/or employee by facilitating new ways of interaction (Bowen, 2016). In doing so, technology changes the way work is organized and the roles employees may assume in the new work environment, as well as spawns novel ways of capturing economic value in services (Larivière at al., 2017). Findings discussed herein support these notions and predict further changes to the service encounter with regards to food service. In general, two major changes are on the horizon: a move towards hyper-personalized encounters and a move away from encounters being centred solely on food.

First, customers will expect increasingly personalized food service encounters. This includes the service as well as the food that is being served. The personalization of service encounters is nothing new. Previous research has asserted rather strongly that personalized encounters lead to positive patronage-related outcomes, such as satisfaction and reuse intention (Mittal and Lassar, 1996). The difficulty has been personalizing encounters at scale, leading multi-site operators to largely disregard personalization and resort to standardization through service scripting (Victorino, Verma and Wardell, 2008). However, the aggregation of massive amounts of data combined with increasingly intelligent algorithms able to sift through it all has reignited the interest in large-scale personalization (Neuhofer, Buhalis and Ladkin, 2015). Particularly relevant for food service is the fact that consumers have taken to wearable technologies in hordes, collecting and uploading an unprecedented amount of biometric data (Liu, 2019). This is likely to be strongly reflected in food servuce encounters in, whereby the encounter, including its pre-, core-, and post-stages (Voorhees et al., 2017), and the offering will be highly personalized based on data collected by personal sensing technology across different touchpoints. This means food service encounters will increasingly adhere and adapt to customers' individual nutritional requirements as well as their personal health plan or wider lifestyle.

Second, the food service encounter may not necessarily be centred on food at all, as operators are increasingly starting to look elsewhere to fill empty seats and revitalize brands. For instance, traditional restaurants may evolve into a meeting hub where the operator is simply in charge of providing the facilities and customers pay a fee – either one-off or subscription-based – for the use of space (Price, 2019). They might also branch out to offer services not traditionally associated with eating out. High-end department store Selfridges offers a recent example of a similar move in retail: in an effort to better serve its customers and to stand out from competition, Selfridges became the first department store in the world to install an on-site cinema at its Oxford Street premises (Smithers, 2019). Some restaurateurs are already taking these notions further by offering agile concepts that have shifting usages throughout the day. Regardless of the degree and direction, the traditional service

encounter in food service is set for change. This opens up a plethora of questions to examine in future research, such as:

Q1. To what extent do restaurant-goers own and use wearable technology that measures biometric data?

Q2. How do customers perceive privacy and sharing of said data in food service settings?

Q3. Which parts of the traditional service encounter are most suitable for personalization in food service?

Q4. How does the (mass) personalisztion of pre-, core-, and post-service encounter differ in the context of food service?

5.1.2 Service sequence

The expectation of immediacy and seamlessness of experience, combined with a plethora of novel and emerging channels of interaction rearrange and change the conventional service sequence in food service. For example, innovative restaurants are already offering customers the chance to place and pay for their order before arriving on site (De Keyser et al., 2018). Some have turned to a subscription-based model, which eliminates ordering and paying completely (Lunden, 2017). There is also a surge in demand for food delivery. In the UK alone, Statista (2017) estimated the market at £6.2 million, while future predictions expect delivery's global market share to reach $350 billion by 2030 (Cheng, 2018). This will only be exacerbated by the deployment of autonomous vehicles and drones (Eliot, 2019). In essence, customers expect more freedom to curate their own meal experiences, whether on-site or at home, and businesses are continuously on the lookout for novel ways to serve. This calls for the re-conceptualisation of service sequence in food service, as the sheer scope of available offerings, new channels of interaction, as well as the scale of consumption, reduces the traditional service sequence built on conventional full-service brick-and-mortar restaurants redundant (Reichheld et al., 2017). To further examine the emerging new ordering of food service encounters, the following research questions are suggested:

Q5. What are the key elements of service sequence in modern food service, regardless of channel of interaction?

Q6. How does the reordering of service sequence elements impact customer outcomes?

Q7. How might these evolve as technology (e.g., wearables) advance and allow for automated personalization at scale?

5.1.3 Servicescape

As the way service is delivered (the service encounter) and the order of individual touchpoints (the service sequence) are changing, so are the environments within which service interaction takes place. Driven by customers' insatiable hunger for new things, restaurants are increasingly required to retrofit and update their equipment and décor (Humphreys, 2017). This has direct implications on the way food service environments are designed: from "built to last" to "built to evolve." In order to better understand emergent elements of a servicescape that is in constant flux, the following research questions are suggested:

Q8. How does the notion of restaurants as multi-use spaces change the concept of servicescape in food service?

Q9. How do we create servicescapes that make the transition to multi-use effortless?

Q10. How do operators plan for, justify, and evaluate invesments in emerging technology?

Another consideration pertaining to servicescape is spatiality, i.e., changes brought about by the notion that restaurant services might not be tied to a physical space in the future, either in part or completely. For instance, operators are already experimenting with novel concepts that make use of virtual reality or mixed reality technologies, taking the concept of multisensory dining – considering the consumption of food as an experience that encompasses all five senses (Spence and Piqueras-Fiszman, 2014) – to an unforeseen level (Nichols, 2018). This poses challenges to the design of servicescapes, and opens several avenues of research:

Q11. How might the design of virtual or mixed reality food service servicescapes differ from traditional brick-and-mortar?

Q12. How may restaurants best adapt their existing physical experiences to encompass new elements of virtual and mixed reality?

Finally, the victory march of delivery poses perhaps the most disruptive change of all, as hallmark food aggregator and delivery platforms transition from order fulfilment to food production (Bell, 2019). Dark kitchens (i.e., the preparation and delivery of food from centrally-located, factory-like production hubs as opposed to high street restaurants) may in some cases cut the need for physical servicescapes completely (Wearn, 2019). The shift from customer-facing brick-and-mortar service environments to "virtual kitchens" calls for more research on the future of servicescape:

Q13. What elements make up the servicescape in virtual restaurants?

Q14. How might customer expectations differ between branded brick-and mortar restaurants and centralised, platform-operated dark kitchens?

5.2 Managerial implications

The proposed theoretical implications pose several managerial considerations from opportunities to exploit to barriers to overcome.

5.2.1 Opportunities to exploit

The reconceptualized sociomateriality of food service holds several implications for the management of hospitality offerings. Decision-makers need to carefully consider the advantages a first-mover position brings when it comes to leveraging and capitalizing on emerging trends and technology. As discussed by Schuelke-Leech (2018), during times of certainty, technological change tends to be cumulative, as investors and businesses alike look for incremental, short-term gains. However, the opposite is true when times are uncertain; investment tends to move towards taking greater, more expensive and potentially more disruptive risks that have fundamental implications for the long-term business environment. Several leading economists, academics, and technologists have noted the

exponentially disruptive socio-economic transformation that may occur in the coming decades as technological progress works its way through increasingly radical periods of rapid growth (Frey and Osborne, 2017; World Economic Forum, 2018).

To address this, hospitality managers need to think about the capabilities and resources they need to possess and processes they need to put in place in order to prepare for an uncertain future. For example, how might the physical layout of a kitchen need to be modified to facilitate aquaponic farming? How might this differ should the restaurant be repurposed as a public space, e.g. a library, every other day? Understanding the different material disruptions on the horizon as well as the global and local trends driving these will help decision-makers put together a strategy that is more likely to succeed in the long run. It is expected that the first-movers will reap much of the benefits of technological change (Atluri et al., 2018).

On a practical level, Noone and Coulter (2012) argue that emerging technologies offer food service businesses improvements in demand prediction, quality control, and process management. It is therefore imperative that operators identify the most repetitive processes in current operations, as well as evaluate the benefits of putting in place a more predictive inventory management strategy. The potential for increasing efficiency is clear, as the UK Office for National Statistics (ONS, 2019) sees that about half of the tasks of a chef (53.87%) are automatable with current technology, while the job of a bartender or a waiter is even more readily automatable (70.66% and 72.81% of tasks automatable, respectively). Striking a balance between material and social actors in service production and delivery will increase in importance, and to stay relevant hospitality operators need to adopt a mind-set of continuous improvement that spans across individual processes to entire business models (Bell, 2019).

5.2.2 Barriers to overcome

It is important to note that not all ideas are as implementable as others due to several technical, regulatory, infrastructural, as well as ethical challenges. First, to facilitate the seamlessness of customer experience within and across the food service sector, it is imperative that stakeholders find ways to access, share, and analyze data on-demand. Several economists have proclaimed data as the

single most valuable asset a company can hold in the 21st century, topping even oil in value (The Economist, 2017). Traditionally, customer data in food service has been captured through direct customer engagement with a brand (Oh and Pizam, 2008). However, in the intra- and interconnected sociomateriality, the traditional operator-specific customer loyalty programmes are proving out to be insufficient as the new generation of consumers prefer price and convenience over loyalty (Fromm and Garton, 2013). The state-of-the-art solution seems to be teaming up with one of the big technology companies (e.g., Facebook, Google) and leveraging customer data scraped from their respective platforms. In the context of food service, this might mean that customers log-in to a restaurant's mobile application using their existing credentials. However, this poses several issues with regards to data protection, exploitation, privacy, and liability. It is imperative that businesses push for data policies that put the customer right and centre, facilitating seamless flow of data without sacrificing personal ownership or agency (Tussyadiah, Li and Miller, 2019).

Second, a major issue food service operators face is retrofitting, that is, the difficulty of integrating new technology as part of a broader system consisting largely of legacy systems (Scott, 2011). To combat this, restaurants need to invest in technology that can be adapted and updated as time goes on. Even though one-off purchases are easier to manage and budget for, technology as a service (TaaS) is an emerging purchasing model that will keep operators kitted in the long term (Lah and Wood, 2016). The electric car manufacturer Tesla offers a good benchmark in transportation. Even though on the surface Tesla may seem to be in the business of selling physical products, the company's focus is not merely on unit sales. Instead, Tesla uses much of its resources to continually fine-tune and improve the software running its cars, adding new features regularly. The ethos is that once a customer buys a car from Tesla, they are covered for life. The company will keep updating its hardware as new innovations, and regulations, arise (Voigt, Buliga and Michl, 2017). It is imperative that food service operators support similar initiatives.

6. Conclusion and Limitation

The future tends to be extremely elusive and difficult to predict. It is impacted and shaped by a plethora of intersecting factors, from political upheavals to the fluctuating economy; technological

advances to the increasingly deteriorating environment; and from falling birthrates to increased lifespans. However, this should not prevent forward-looking restaurateurs from taking a proactive stance and preparing for things to come. By bringing together a diverse set of stakeholders, this study explored how the socio-technical system of food service is changing. Trends around service interaction, structure, and setting were analysed through the lens of sociomateriality, which sees value creation in organizations as formed by both social (e.g., employees and customers) and material (e.g., technology) actors (Orlikowski, 2010). The findings suggest a growing pressure of material over social across all key dimensions of service concept, namely: service operations, service experience, service outcome, and the value of service (Johnston, Clark and Shulver, 2012).

Driven by advances in data analytics and service automation (Ivanov and Webster, 2019), it is expected that a growing number of tasks currently carried out by social actors will be delegated to material actors. This poses considerable implications for food service operations and offerings (Tung and Law, 2017). On one hand, the re-design of existing processes allows employees to move from low-skilled manual tasks to more expert work. Similarly, leveraging technology will allow operators to offer more seamless and personalized service to customers at an unprecedented pace and scale (Buhalis and Sinarta, 2019). However, at the same time customers will increasingly expect and employees demand transparency of operations and sustainability of employment practices (Olayanju, 2019).

To successfully navigate the changing operational environment, food service managers are encouraged to look beyond short-term reporting (e.g. fiscal year) and extend their strategic planning to the long term. The future trends discussed herewith open several avenues for action. For example, as customer expectations continue to ramp up, operators might consider adopting an agile business model whereby the offering, operations, and the operational environment change throughout the day or week (e.g. from a restaurant to a co-working space) (Price, 2019). Similarly, some operators might choose to adopt a modular approach to their back-of-house systems management by making specialized equipment (e.g. sous vide machines, combination ovens) (Ray, 2019) easy to swap out and plug in as trends fluctuate. As a result, smart purchasing models, especially the rise of technology as a

service, will grow in importance. Finally, besides adapting to customer demand, operators might also explore new ways of producing and procuring ingredients. Growing interest and investment in vertical farming, synthetic food, and autonomous delivery offer novel ways of adding and capturing value (Riehle et al., 2019).

As we head towards a new decade, food service managers should start to consider the relative importance of both social and material actors in their operations, as well as the likely changes on each. With that being said, according to Inayatullah (2009) visions about the future should always be taken with a grain of salt. Indeed, this study has several limitations that should be noted. First, even though the study collected opinions from a wide range of stakeholders, it did so only within the confines of the UK. Cross-validation of food service trends identified herein is warranted. Second, this took a vertical view and discussed how the overall sociomateriality of food service is changing. Further research should adopt a more horizontal view, and examine the individual elements discussed herewith in greater theoretical depth. The research questions (Q1-Q14) posed after each section are suggested to guide in realising this. Third, the study utilised a specific future workshop approach, LEGO® Serious Play®. A different approach (e.g., Open Space Technology [Owen, 2008]) or a different time frame (e.g., five or 50 years) might have produced a different set of key trends.

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Appendix 1

Activity	Instructions	Group size	Time	Equipment
Introduction	Introduce agenda and method.	All	15 minutes	PowerPoint
SB: Tower	Build a tower in 2 minutes using only the bricks given.	Individual	5 minutes	Window Exploration Bag
Sharing	Ensure everyone is comfortable with building LEGO®.	Individual	5 minutes	Window Exploration Bag
Reflection	Note how every tower is different; countless ways to address a challenge despite same resources.	All	5 minutes	Window Exploration Bag
AT1	Build a model that represents the best part in your job/role in food service / Build a model that represents the best part in food service as a customer.*	Individual	10 minutes	Window Exploration Bag
Sharing	Each participant shares what they have built and why.	Individual	10 minutes	Window Exploration Bag
Reflection	Open discussion, participants are invited to reflect what everyone has shared. Identify key themes that started to emerge.	All	10 minutes	Window Exploration Bag
AT1	Build a model that reflects your view of how food service will look like in 2039. Reflect on service interaction, structure, and setting.	Individual	10 minutes	Identity and Landscape Kit
Sharing	Each participant shares what they have built and why.	Individual	10 minutes	Identity and Landscape Kit
Reflection	Open discussion, participants are invited to reflect what everyone has shared. Identify emerging key themes. Is there a preference for a certain future vision over others?	All	10 minutes	Identity and Landscape Kit
AT2	In small groups, restate key elements of your individual model (vision) of the future of food service. Using that as the starting point, work together to build a shared model that incorporates key elements from everyone's individual models.	Small groups	20 minutes	Identity and Landscape Kit
Story	As a group, prepare and present a short pitch capturing key elements of your group's proposed service concept.	Small groups	10 minutes	Identity and Landscape Kit
Reflection	Open discussion, participants are invited to reflect what everyone has shared. Identify emerging key themes. Is there a preference for a certain future vision over others?	All	10 minutes	Identity and Landscape Kit
Structured Discussion	Looking at service interaction, its structure, and setting in greater detail. How do participants see social and material actors interact and create value in future food service?	All	60 minutes	PowerPoint
Conclusion	Final thoughts, reconfirming key points from discussions.	All	10 minutes	PowerPoint
Feedback	Open feedback.	All	10 minutes	PowerPoint

Notes: *Question depended on stakeholder group size; SB = Skills Building; AT = Application Technique; Total time = 3 hours 30 minutes