Data-driven Customer Journey Mapping in Local High Streets: A Domain-specific Modeling Language

Short Paper

C. Ingo Berendes
Paderborn University
Paderborn, Germany
ingo.berendes@upb.de

Christian Bartelheimer
Paderborn University
Paderborn, Germany
christian.bartelheimer@upb.de

Jan H. Betzing
University of Muenster, ERCIS
Münster, Germany
jan.betzing@ercis.de

Daniel Beverungen
Paderborn University
Paderborn, Germany
daniel.beverungen@upb.de

Abstract

In high street retail, abundant research has focused on conceptualizing, empirically investigating, and improving customer experience at touchpoints throughout the customer journey. However, IT—including, smartphones, near-field communication, and broadband access to the Internet—permeates local high streets increasingly and is profoundly transforming the way in which customer experience is co-created throughout a high street customer journey. Current customer experience notations are unable to express customer journeys based on data retrieved from a digitized physical servicescape. The purpose of this paper is to design a domain-specific modeling language (DSML) that enables analyzing and designing customer journeys in a digitized high street retail setting. From a design-oriented standpoint, the developed High Street Journey Modeling Language (HSJML) can be used to design and implement online-offline customer journeys in digitized high streets. From an empirical perspective, the HSJML provides the constructs required for mapping, analyzing, and predicting online-offline customer journeys in local high streets, based on analyzing event-logs from retail platforms.

Keywords: Customer Journey Mapping, Customer Experience, Domain-specific Modeling Language, Conceptual Modeling, Business Process Management

Introduction

Customer experience is central to both service researchers and practitioners seeking sustainable competitive advantage by focusing on customer value co-creation (McColl-Kennedy et al., 2015; Lemon and Verhoef, 2016; Betzing et al., 2018). Previous research has identified "satisfaction, trust, re-visit intention, re-purchase intention and loyalty [...] as outcomes of positive customer experience" (McLean et al., 2018, p. 326). Being highly subjective and continuous in nature, the customer experience accrues along the customer journey, a time-logical sequence of touchpoint instances a customer has with one or more service providers and other actors in the purchase process (Halvorsrud et al., 2016; Voorhees et al., 2017).

Digital technologies increasingly permeate high street retail and profoundly impact customers' decision processes and journeys. Customers have myriads of digital and physical touchpoints with retailers

(Brynjolfsson et al., 2013). Along the purchase process, customers seamlessly switch between digital and physical channels as well as service providers, sometimes using multiple channels in parallel (e.g., using a smartphone while interacting with a service person), which transforms customer journeys into sequences of intermingling online and offline service encounters (Haugstveit et al., 2016; Bartelheimer et al., 2018). Albeit the complexity of potential customer journeys increases, so does the amount of digital evidence customers leave behind. Nowadays, high streets see an uptake of local multi-sided digital community platforms, which network local customers, retailers and other high street stakeholders, and provide digital service (Bartelheimer et al., 2018). Instead of performing time- and cost-intensive surveys, customer journeys might now be inferred and modeled directly from the data collected on these platforms (Betzing, 2018).

As opposed to the prospects of data-driven customer journey mapping, traditional customer journey theory (e.g., Shostack, 1987) insufficiently accounts for intermingling online-offline touchpoints, and the perspective of multiple actors (e.g., multiple retailers, intermediaries, other customers), who attribute to the overall high street customer experience (Lemon and Verhoef, 2016; Betzing et al., 2018). Likewise, existing notations such as customer journey mapping and service blueprinting (Bitner et al., 2008; Voorhees et al., 2017) fall short of explaining how online-offline customer journeys unfold in digitized physical servicescapes.

In line with the dual mission of design science research to advance theory while solving organizational problems (Sein et al., 2011), the purpose of this paper is twofold. Our primary research goal is to design a DSML (Frank, 2013) as an IT artifact (March and Smith, 1995) that can be used to model current and design future customer journeys in digitized local high streets. On a more abstract level, the DSML might later evolve into a nascent theory for design and action, prescribing how to design online-offline customer journeys. Second, the DSML departs from current conceptualizations of customer journeys, which view customer journeys as dyadic (as opposed to networked), analog/digital (as opposed to an integrated online-offline view), and isolated customer-provider interactions (as opposed to a multi-layered experience that is focused on the high street as unit of analysis). Our approach, therefore, points at a strong need to update current theory on customer experience and customer journeys for high streets.

The paper unfolds as follows: Section 2 provides a shared understanding of customer journeys. In Section 3, we describe our research method. In Section 4, we sketch our High Street Journey Modeling Language and demonstrate its application in Section 5 with modeling a customer journey in a high street retail scenario. The proposed modeling language is the first notation for modeling and designing complex online-offline customer journeys in digitized high streets, as becomes evident from a conceptual comparison with other modeling notations in Section 6. We conclude with an outlook on future research in Section 7.

Research Background

Customer Journeys

The customer journey perspective roots in a mind shift in service design and marketing research from assuming what the market wants to develop products and services from a customer's viewpoint. Since then, scholars evolved the customer journey approach to understand typical customer behavior (Lemon and Verhoef, 2016), to prototype experiential services (Zomerdijk and Voss, 2010; Teixeira et al., 2012), to assess perceived service quality (Halvorsrud et al., 2016; Rosenbaum et al., 2017), and to design for customer experience (Følstad and Kvale, 2018).

As the customer journey terminology is fragmented at best (Rosenbaum et al., 2017) and there exists no ontology for the field, we draw from the structured literature reviews contributed by Følstad and Kvale (2018), Heuchert et al. (2018), and Bernard and Andritsos (2017) to establish a shared understanding of the core constructs. First, customer experience is the "evolvement of a person's sensorial, affective, cognitive, relational and behavioral responses to a [service offering] by living through a journey of touchpoints along prepurchase, purchase and postpurchase situations and continually judging this journey against response thresholds of co-occurring experiences" (Homburg et al., 2015, p. 384). This definition already encompasses many constructs relevant to the customer journey. Table 1 provides the full set of constructs that are relevant for depicting customer journeys in a digitized world.

Table 1. Constructs for Customer Journeys in a Digitized World	
Construct	**Explanation**
Customer	“The stakeholder experiencing a service” (Bernard and Andritsos, 2017, p. 51).
Service Provider	A firm or individual who engages in a business relationship with a customer (Bartelheimer et al., 2018).
Intermediary	A facilitator of service encounters between customers and service providers that does not take part in the encounter itself (Storbacka et al., 2016; Bartelheimer et al., 2018).
Customer Journey	A time-logical sequence of touchpoints a customer has with one or more service providers and other actors during the purchase process (Halvorsrud et al., 2016; Voorhees et al., 2017; McLean et al., 2018).
Customer Journey Stage	A part of the customer journey that groups associated touchpoints. In retail, customer journeys are often divided into pre-purchase, purchase and post-purchase stages (Lemon and Verhoef, 2016; Bernard and Andritsos, 2017; Heuchert et al., 2018).
Touchpoint	Any instance of discrete interaction between a customer and another actor that is relevant to a service offering (Zomerdijk and Voss, 2010), “including the interaction involving the provision of the service offering itself” (Voorhees et al., 2017, p. 270).
Touchpoint Event	A change of state of an entity, which initiates a touchpoint (Wand and Weber, 1993). Events can arise internal or external to the customer.
Event Type	An abstract class of events with similar properties from which the initiating stakeholder and the channel (i.e., the medium of interaction between two or more actors) can be inferred (Bernard and Andritsos, 2017; Heuchert et al., 2018).
Touchpoint Precondition	A state that must exist a priori to enable a touchpoint event and the associated touchpoint (Wand and Weber, 1993).
Data Trace	Digital information that can be transmitted or processed.

Related Modeling Approaches

Models are used to reduce the complexity of real-world concepts by only depicting aspects relevant to the modeling goal while neglecting irrelevant information. Customer journey mapping comprises a variety of practitioner-driven ways to depict a time-logical sequence of customer touchpoints against a secondary dimension (Følstad and Kvale, 2018). Albeit being very popular in practice, the method is ill-defined in academic literature. Rosenbaum et al. (2017) even named its use a “managerial hodgepodge” (p. 144), where the vertical axis (secondary dimension) is used for various purposes such as identifying the organizational units responsible for specific touchpoints, customer objectives, and channels. Service management provides more formalized approaches such as service blueprinting (Shostack, 1987; Bitner et al., 2008), multilevel service design (Patrício et al., 2011), and customer experience modeling (Teixeira et al., 2012). However, they focus on service delivery from a single service provider’s view, provide tools for designing complex service systems, or aggregate customer data in a way that opposes analyzing individual customer journeys.

Although we fully acknowledge the relevance and benefits of the existing modeling approaches, we maintain that no language is capable to model individual online-offline customer journeys as a sequence of events performed by customers and multiple service providers. Consequently, we design a new event-driven DSML that is able to depict the central concepts of online-offline customer journeys in high streets. Models designed with the proposed modeling language can be used as an ex-post diagnostic tool to understand individual customer retailing behavior and to capture hints on how different touchpoints and actors contribute to the overall customer experience. Furthermore, it provides a graphical notation of the rather intangible “soft” concepts (Heuchert et al., 2018) in customer experience theory.

Research Method

In line with the dual mission of design science (Sein et al., 2011), the approach of this short paper is to design a DSML as an IT artifact (March and Smith, 1995). A DSML is a modeling language that accounts for the needs of particular settings since it includes technical terms that constitute a particular domain (e.g., retail)—such that its users "do not have to reconstruct technical terms on their own" (Frank, 2013, pp. 133-134). A DSML has to provide a clear representation of all constructs relevant to the model purpose, which allow the modeler to create "well-formed statements about the world" (Becker et al., 2014 p. 339). In doing so, DSML foster model quality and comprehensibility of information models (Frank, 2013). Besides fulfilling the requirements for DSMLs by Frank (2013), the objectives of our DSML comprise depicting real-world customer journeys from a data-driven perspective that considers the integrated nature of online-offline touchpoints, and that focuses on the high street as the unit of analysis, which comprises touchpoints with multiple actors. To design our DSML, we applied methods from the conceptual modeling literature that fall into three steps (Wand and Weber, 1993; Frank, 2013). First, we specify the language's abstract syntax by proposing linguistic constructs and modeling rules in a meta-model (Becker et al., 2014). Second, we propose a concrete syntax as a graphical notation (Frank, 2013). Third, we clarify the DSML's semantics by demonstrating its usefulness to model a customer journey in a local high street. The result of this design process is the *High Street Journey Modeling Language (HSJML)*, a DSML with which we can model online-offline customer journeys in high street retail settings based on digital evidence.

As regards a theoretical contribution that goes beyond the form and function inscribed into the DSML, we compare HSJML with other approaches that have been proposed for modeling customer journeys. With this conceptual evaluation, we show that HSJML currently is the only approach that features modeling constructs that depart from touchpoint-event-logs in a high street retail setting. While our short paper provides first insights on how online-offline customer journeys in local retail can be conceptualized based on digital evidence, the approach requires performing an empirical evaluation. To pave the way ahead, we sketch a set of hypotheses that can be tested empirically in our subsequent research (Burton-Jones et al., 2009). Acceptance studies can, on the one hand, identify the DSML's soundness to model online-offline customer journeys ensuing from event-logs. On the other hand, the language can serve as a coding schema for data-driven customer journey mapping with data retrieved from digital retail platforms. While HSJML is primarily motivated from an academic standpoint, empirical studies can reveal how practitioners perceive its ease of use and usefulness with regard to their modeling goals (Recker et al., 2011). Furthermore, we propose that future research on HSJML will eventually enable service providers to predict customer journeys and to intervene pro-actively at single touchpoints to impact the overall customer experience.

A DSML for Online-Offline Customer Journeys

Abstract Syntax

The HSJML takes a holistic, data-driven view on the customer journey. From a sequence of events, both the customer's touchpoints and the retailers' back-stage actions attributing to the journey are derived. Figure 1 provides the meta model of HSJML, depicted as Entity-Relationship-Model in Chen (1976) notation.

HSJML depicts singular customer journey instances. The high street service system stakeholders included in the model are the customer, an intermediary and at least one service provider. The customer's actions can be inferred from data traces, and therefore, HSJML does not include any decision nodes or conditional flows. The customer journey is represented by a time-logical sequence of events, each of which is associated with a data trace and a touchpoint. Additionally, each event belongs to an event type that specifies the semantics of the touchpoint. Touchpoints belong to different stages of the customer journey (Lemon and Verhoef, 2016). Preconditions are optional activities that a service provider has to execute beforehand in order to enable an event and the associated customer touchpoint. Again, data traces denote information that different service providers and the customer have provided to the intermediary in the back-stage to enable the customer journey. For each element in the model, additional information can be attributed at discretion (this is not depicted in Figure 1 for simplification).

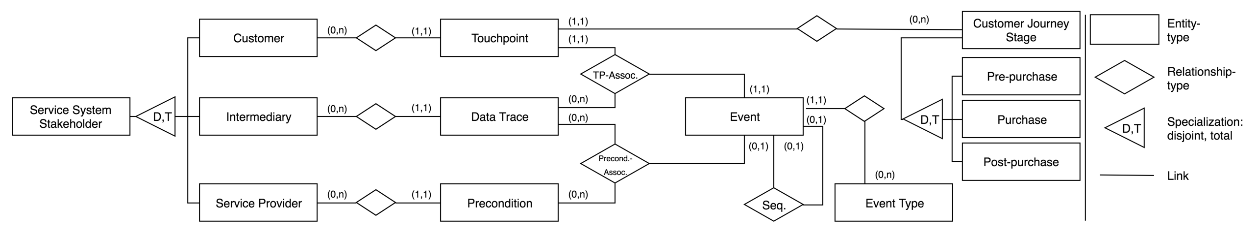

Figure 1. Meta Model of the proposed HSJML

Concrete Syntax / Semantics

The design of HSJML has been informed by established modeling notations such as BPMN 2.0, from which we borrowed pools and lanes as structuring elements (OMG, 2011). A HSJML model consists of one pool each for the customer, the intermediary, and the service providers involved. The intermediary's pool is divided into data lanes facing the customer and the service providers, and a center lane that contains the sequence of identified events for a particular customer journey. The data lanes can be used to depict data traces between the customer and the intermediary, and between service providers and the intermediary, respectively. Data traces can be added freely without constraints. Each discrete state in the customer journey is depicted in HSJML by a tuple containing an event, a touchpoint, and an optional precondition. Table 2 provides an overview of the representational elements, which are available in HSJML and can be used to model a customer journey. The sequence flow between events is depicted by directed arrows. Two types of undirected associations can be used to link an event with data traces and a touchpoint respectively precondition. Touchpoints visualize the interactions between the customer and another actor, as interpreted from the triggering event. The touchpoint background is shaded, depending on respective the journey stage.

Table 2. Concrete Syntax for HSJML

Customer, Service Provider, Intermediary				
Customer Journey	Sequence Flow	Precondition Association	Touchpoint Association	
Touchpoint	**Pre-purchase** touchpoint	**Purchase** touchpoint	**Post-purchase** touchpoint	
Touchpoint Event, Event Type	Customer has **performed a platform look-up.**	Customer has **entered the high street area.**	Customer has **left the highstreet area.**	Customer has **received a personalized offer.**
	Customer has **published a review**.	Customer has **entered service provider's vicinity.**	Customer has **left service provider's vicinity.**	Customer has **redeemed a personalized offer.**
	Customer has **concluded a purchase.**	Customer has **entered service provider's entrance area.**	Customer has **left service provider's entrance area.**	Customer's **position** has been **tracked.**
	Customer has **marked** sth. **as favorite.**	Customer has **received a recommendation.**	Customer has **started a navigation.**	Customer has **contacted a retailer.**
Touchpoint Precondition	**Precondition:** Requirement that was fulfilled before event was triggered.			

Demonstration of Utility and Evaluation of Form and Function

The scenario used to demonstrate and evaluate the HSJML is taken from the consortium research project "smartmarket²". Central to smartmarket² is a multi-sided platform, which networks different groups of actors in high street retail. The platform facilitates touchpoints between these actors and collects event-log data in the back-stage. A typical high street shopping scenario facilitated by smartmarket² looks as follows:

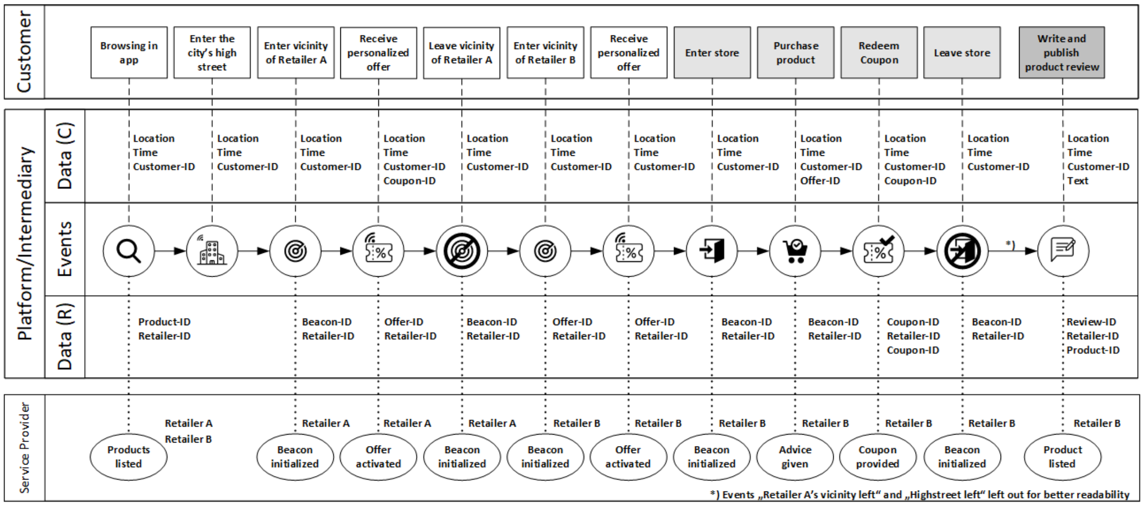

Figure 2. Exemplary High Street Customer Journey, as Modeled with the HSJML

At home, Mr. Davis takes his smartphone and opens the smartmarket² app to browse local retailers' offerings, products, prices, and events taking place in the city center. Quickly, he found interesting products that he wants to inspect at a retailer's store, so he organizes his shopping tour on the high street. He passes along different retailers until he approaches retailer A's store. A uses beacons, small Bluetooth transponders, which broadcast a signal that can be processed by passersby's smartphones. Based on the signal, the smartmarket² app notifies Mr. Davis that retailer A is nearby and provides him with the retailer's offers. However, Mr. Davis is not interested in A's offers and continues the shopping tour until he passes retailer B, from whom he also receives personalized offers. This time, Mr. Davis is interested and enters the store. In-store, he consults a service person and then purchases the product offered, using a previously received mobile discount coupon. Satisfied with the product and the service received, Mr. Davis, later on, writes a positive review on his experience in the smartmarket² app.

Figure 2 reconstructs Mr. Davis' shopping trip using event-log data collected by smartmarket².

Conceptual Comparison to Related Modeling Approaches

Table 3. Construct-based Conceptual Comparison of Related Modeling Approaches

Language	HSJML	BPMN 2.0	Customer Journey Mapping	Service Blueprinting	Multi-level Service Design	Customer Journey Modeling Language
Source	this paper	(OMG, 2011)	(Rosenbaum et al., 2017)	(Bitner et al., 2008)	(Patrício et al., 2011; Teixeira et al., 2012)	(Haugstveit et al., 2016)
Goal	Data-driven construction and analysis of customer journeys	General process modeling	Service Innovation	Service Innovation	Service Innovation	Documentation and analysis of service delivery
Granularity	Individual	Individual	Aggregated	Both	Aggregated	Individual
Available Constructs						
Customer Journey	Yes	Partly (seq. flow)	Yes	Yes	Yes	Yes
Stages	Yes	No	Yes	No	Yes	No
Touchpoints	Yes	Partly (generic tasks)	Yes	Partly (only with a focal provider)	Yes	Yes
Events / Event Types	Yes / Yes	Yes / Partly	No / No	No / No	No / No	No /Partly (touchpoints are specialized)
Data	Yes	Partly (messages and data objects)	No	No	Partly (IT artifacts)	No
Multiple service providers	Yes	Partly (multiple pools)	No	No	No	Partly (support for multiple actors)
Intermediary	Yes	Partly (pool)	No	Partly (backstage processes)	No	Partly (support for multiple actors)

We have shown that HSJML is able depict high street customer journeys as a sequence of events. To demonstrate its superiority for the given application scenario, we compared HSJML to related modeling approaches from different schools of thought (Table 3). All related approaches can be used to visualize customer journeys in high streets but do so only to a limited extent. First, HSJML is the only data-driven approach that shapes customer-specific chains of events from event-logs and, therefore, enables the construction, description, and analysis of individual customer journeys with digital evidence. Second, customer journey mapping and multi-level service design depict expected customer journeys on an aggregated level, where insights from multiple customers are combined. Third, except for BPMN 2.0, the related approaches assume a focal service provider and do not cope with the multi-actor nature of high street retail. HSJML explicitly builds on and represents the logic of an intermediary as a facilitator of service encounters (Storbacka et al., 2016). Lastly, BPMN 2.0 is a generic process modeling language, which does not include any domain-specific customer journey constructs such as stages, touchpoints, and high street events.

Contribution, Limitations, and Outlook

Digital technologies have profoundly transformed high streets into digital and at the same time physical servicescapes. New forms of behavioral customer data become available through digital interactions, which call for new methods to visualize and describe these online-offline customer journeys on high streets. In this short paper, we developed and demonstrated HSJML as a domain-specific modeling language for high street retail and conducted a conceptual construct-based analysis vis-á-vis rival modeling approaches.

As an IT artifact, HSJML can be used to visualize high street customer journeys. HSJML is the only modeling language that can depict multi-actor, online-offline customer journeys in high streets. As a conceptual tool, the language can be used to conceptualize customer journeys a priori. A posteriori, the language can be used for data-driven customer journey mapping, analyzing digital evidence recorded on high streets (e.g., data gathered by intermediaries, such as digital platforms). The resulting models can, therefore, serve as a diagnostic tool to understand, analyze, and predict how individual customers traverse a high street.

From a theoretical perspective, HSJML departs from traditional customer journey mapping and customer experience theory in two ways. First, HSJML is the first modeling language to conceptualize customer journeys with the high street as a unit of analysis, whereas related approaches focus on individual touchpoints or dyadic retailer-customer interactions. Our view implies that stores can be networked with each other, and customers interact with multiple stores while traversing a high street. Second, we conceptualize a customer journey as intermingled online-offline interactions, enabled by a digitized physical servicescape, whereas current theory views customer journeys as consisting of separate online or offline interactions.

In subsequent research, we will evaluate the language's organizational impact in order to develop generalized design knowledge. In particular, we will identify the language's ability to enable designers to specify customer journeys in high streets, and its ability to perform data-driven customer journey mapping for a high street as a unit of analysis. Inspired by Burton-Jones et al. (2009) and Recker et al. (2011), the following hypotheses might guide the empirical evaluation of the HSJML for designing and interpreting customer journeys in digitized local high streets:

Hypothesis 1: As regards online-offline customer journey in high streets, HSJML will outperform related modeling languages in terms of *representational fidelity*, enabling designers to conceptualize effective customer journey maps.
Hypothesis 2: As regards online-offline customer journey in high streets, HSJML will outperform related modeling languages in terms of *representational efficiency*, enabling designers to conceptualize customer journey maps more efficiently.
Hypothesis 3: As regards online-offline customer journey in high streets, HSJML will outperform related modeling languages in terms of *interpretational fidelity*, enabling stakeholders in a high street to more effective understand customer journey maps.
Hypothesis 4: As regards online-offline customer journey in high streets, HSJML will outperform related modeling languages in terms of *interpretational efficiency*, enabling stakeholders in a high street to more efficiently understand customer journey maps.

Since design is a search process (Hevner et al., 2004), the design of the HSJML comes with limitations. First, as the requirements defined for designing an artifact can never be complete, by definition (Alexander, 1964), the current abstract syntax is necessarily non-exhaustive and—just like our short paper—is a snapshot in an ongoing research effort that will be iteratively refined. On the one hand, the evaluation might hint at the need for conceptual extensions. On the other hand, the set of event types provided is an informed selection that can be freely expanded to cater for other potential events in a journey. Second, currently there are no modeling tools available that can build HSJML models automatically from event-logs. We rely on human coders to interpret event-logs and manually model customer journeys as depicted in Figure 2. To do so, we provide a set of shapes for the flowcharting tool Microsoft Visio. Third, reconstructing customer journeys from event-logs requires data to be available for all touchpoints. While multi-sided local community platforms are becoming more common in high street retail, their adoption by customers is hampered by privacy concerns regarding personal data (Bartelheimer et al., 2018; Betzing, 2018). Moreover, to yield insights from non-digitized, physical touchpoints (e.g., interpersonal service), retailers would have to collect information on the service encounters manually. Nevertheless, with ongoing digitalization and platforms that implement and clearly communicate privacy-preserving behavior, larger amounts of event-log data will become available in the future.

Eventually, data-driven customer journey mapping can be realized, where techniques from process mining are applied to analyze event-logs. Data and information from existing customer journey models can be combined with event-logs to discover, conform and enhance customer journeys (van der Aalst, 2016). Instead of relying on human interpretation to build HSJML models, the models will then be constructed from event-log data automatically. Bernard and Andritsos (2017) propose a technical representation of customer journeys that serves as input for existing process mining tools such as *ProM* to derive insights (van der Aalst, 2016). However, their approach lacks a domain-specific graphical representation—a gap that HSJML closes. Process mining can be used to derive "de facto" models from data, and to compare these models with previously established "de jure" models to identify if and how customers respond to provided cues (e.g., receiving personalized offers through the platform). By aggregating data from multiple customer journeys, metrics such as throughput times and points where customers are often lost can be derived as insights that directly relate to customer experience. Further, transition probabilities might enable predicting the customer's next moves or even predict whole customer journeys in a high street in real-time. Finally, event-logs and analyses can be enriched with external data (e.g., weather data) to yield context-savvy insights.

To conclude, HSJML provides the foundation for the event-driven construction and visual analysis of customer journeys in high street retail. With the further development of HSJML, the availability of event-log data, and the adaption of process mining techniques, valuable insights regarding online-offline customer journeys and customer experience created therein can be derived to advance theory and practice.

Acknowledgements

This paper was developed in the research project smartmarket² (www.smartmarketsquare.de), which is funded by the German Federal Ministry of Education and Research (BMBF), promotion signs 02K15A073-02K15A074. The authors thank the Project Management Agency Karlsruhe (PTKA).

References

Alexander, C. (1964). *Notes on the Synthesis of Form*. Cambridge, MA, USA: Harvard University Press.

Bartelheimer, C., J. H. Betzing, I. Berendes, and D. Beverungen. (2018). "Designing Multi-sided Community Platforms for Local High Street Retail." In: *ECIS 2018 Proceedings*. Portsmouth, UK.

Becker, J., D. Beverungen, R. Knackstedt, et al. (2014). "On the ontological expressiveness of conceptual modeling grammars for service productivity management." *Information Systems and E-Business Management*, *12*(3), 337–365.

Bernard, G. and P. Andritsos. (2017). "A Process Mining Based Model for Customer Journey Mapping." In: *CEUR Workshop Proceedings* (Vol. 1848, pp. 49–56).

Betzing, J. H. (2018). "Beacon-based Customer Tracking across the High Street: Perspectives for Location-based Smart Services in Retail." In: *AMCIS 2018 Proceedings*. New Orleans, LA, US.

Betzing, J. H., D. Beverungen, and J. Becker. (2018). “Design Principles for Co-Creating Digital Customer Experience in High Street Retail.” In: *MKWI 2018 Proceedings* (pp. 2083–2094). Lüneburg, DE.
Bitner, M. J., A. L. Ostrom, and F. N. Morgan. (2008). “Service Blueprinting: A Practical Technique for Service Innovation.” *California Management Review*, *50*(3), 66–94.
Brynjolfsson, E., Y. J. Hu, and M. S. Rahman. (2013). “Competing in the Age of Omnichannel Retailing.” *MIT Sloan Management Review*, *54*(4), 23–29.
Burton-Jones, A., Y. Wand, and R. Weber. (2009). “Guidelines for Empirical Evaluations of Conceptual Modeling Grammars.” *Journal of the Association for Information Systems*, *10*(6), 495–532.
Chen, P. P.-S. (1976). “The Entity-Relationship Model - Toward a Unified View of Data.” *ACM Transactions on Database Systems*, *1*(1), 9–36.
Følstad, A. and K. Kvale. (2018). “Customer journeys: a systematic literature review.” *Journal of Service Theory and Practice*, *28*(2), 196–227.
Frank, U. (2013). “Domain-Specific Modeling Languages: Requirements Analysis and Design Guidelines.” In: I. Reinhartz-Berger, A. Sturm, & T. Clark (Eds.), *Domain Engineering* (pp. 133–157). Springer.
Halvorsrud, R., K. Kvale, and A. Følstad. (2016). “Improving service quality through customer journey analysis.” *Journal of Service Theory and Practice*, *26*(6), 840–867.
Haugstveit, I. M., R. Halvorsrud, and A. Karahasanovic. (2016). “Supporting Redesign of C2C Services through Customer Journey Mapping.” In: *ServDes 2016 Proceedings* (Vol. 125, pp. 215–227).
Heuchert, M., B. Barann, A.-K. Cordes, and J. Becker. (2018). “An IS Perspective on Omni-Channel Management along the Customer Journey: Development of an Entity-Relationship-Model and a Linkage Concept.” In: *MKWI 2018 Proceedings* (pp. 435–446). Lüneburg, DE.
Hevner, A. R., S. T. March, J. Park, and S. Ram. (2004). “Design science in information systems research.” *MIS Quarterly*, *28*(1), 75–105.
Homburg, C., D. Jozić, and C. Kuehnl. (2015). “Customer experience management: toward implementing an evolving marketing concept.” *Journal of the Academy of Marketing Science*, *45*(3), 377–401.
Lemon, K. N. and P. C. Verhoef. (2016). “Understanding Customer Experience and the Customer Journey.” *Journal of Marketing*, *80*(6), 69–96.
March, S. T. and G. F. Smith. (1995). “Design and Natural Science Research on Information Technology.” *Decision Support Systems*, *15*(4), 251–266.
McColl-Kennedy, J. R., A. Gustafsson, E. Jaakkola, et al. (2015). “Fresh perspectives on customer experience.” *Journal of Services Marketing*, *29*(6/7), 430–435.
McLean, G., K. Al-Nabhani, and A. Wilson. (2018). “Developing a Mobile Applications Customer Experience Model (MACE)- Implications for Retailers.” *Business Research*, *85*, 325–336.
OMG. (2011). “Business Process Model and Notation (BPMN), Version 2.0.” URL: http://www.omg.org/spec/BPMN/2.0/ (visited on 09/04/2018).
Patrício, L., R. P. Fisk, J. F. e Cunha, and L. Constantine. (2011). “Multilevel service design: From customer value constellation to service experience blueprinting.” *Journal of Service Research*, *14*(2), 180–200.
Recker, J., M. Rosemann, P. Green, and M. Indulska. (2011). “Do Ontological Deficiencies in Modeling Grammars Matter?” *MIS Quarterly*, *35*(1), 57–79.
Rosenbaum, M. S., M. L. Otalora, and G. C. Ramirez. (2017). “How to create a realistic customer journey map.” *Business Horizons*, *60*(1), 143–150.
Sein, M. K., O. Henfridsson, S. Purao, et al. (2011). “Action Design Research.” *MIS Quarterly*, *35*(1), 37–56.
Shostack, G. L. (1987). “Service Positioning through Structural Change.” *Journal of Marketing*, *51*(1), 34.
Storbacka, K., R. J. Brodie, T. Böhmann, et al. (2016). “Actor engagement as a microfoundation for value co-creation.” *Journal of Business Research*, *69*(8), 3008–3017.
Teixeira, J., L. Patrício, N. J. Nunes, et al. (2012). “Customer experience modeling: from customer experience to service design.” *Journal of Service Management*, *23*(3), 362–376.
van der Aalst, W. (2016). *Process Mining: Data Science in Action* (1st ed.). Berlin, Heidelberg: Springer.
Voorhees, C. M., P. W. Fombelle, Y. Gregoire, et al. (2017). “Service encounters, experiences and the customer journey: Defining the field and a call to expand our lens.” *Business Research*, *79*, 269–280.
Wand, Y. and R. Weber. (1993). “On the ontological expressiveness of information systems analysis and design grammars.” *Information Systems Journal*, *3*(4), 217–237.
Zomerdijk, L. G. and C. A. Voss. (2010). “Service design for experience-centric services.” *Journal of Service Research*, *13*(1), 67–82.